Egyptian Knowledge Bank
https://ijmti.journals.ekb.eg/
International Journal of Materials Technology and Innovation
DOI: 10.21608/ijmti.2022.278188
IJMTI
Online ISSN 2682-4299

Metallurgical Industries and Future Technology Workshop

Under the patronage of His Excellency

Prof. Dr. Mohammad Ayman Ashour

Minister of Higher Education and Scientific Research

And

Prof. Dr. Emad M Ewais

President of Central Metallurgical R&D Institute (CMRDI)

Organized By

Metals Technology Institute (MTI)

21 September 2022 , Holiday Inn Maadi, Corniche El Nil, Cairo

About the workshop

The workshop on "Metallurgical Industries and Future Technology" will be held under the auspices of Prof. Dr. Mohamed Ayman Ashour, Minister of Higher Education and Scientific Research, and Prof. Dr. Emad Mohamed Ewais, Head of CMRDI, within the framework of the vision of strengthening the links between scientific research and industry, and through deepening local industrialization and creating effective partnerships between industry and CMRDI in the field of metallurgical industries to achieve a high level of excellence that contributes to achieving regional and international leadership. The workshop will be held on Wednesday, September 21, 2022 at Holiday Inn Maadi, Corniche El Nil, Cairo, at 9 AM.

The workshop aims to present the outputs of industrial research projects to the Egyptian production bodies, whether in the public business sector or the private sector, as well as small and medium industries. The workshop also aims to listen to the leaders of metallurgical industries in various fields to learn about their visions, problems and challenges facing them, and to interact between industrialists and specialized researchers professors to provide and find feasible solutions through constructive cooperation between industry and scientific research in the field of metallurgical industries.

During the workshop, successful models carried out by the Institute of Metals Technology to deepen local industrialization and find technological solutions to the problems facing the Egyptian industry will be presented. The workshop will cover the following axes: modern technologies in the steel industry (laser smelting - slag remelting,...), metal forming (design of rolling lanes, formation maps and constraints, modeling and simulation,...), the field of non-ferrous metals industry, the field of advanced coatings and corrosion protection, the field of energy conservation, the field of green energy, and the field of environmental considerations in the metallurgical industries.

In the end, a closing session will be held to come up with the most important recommendations to activate the cooperation between the institute's departments with the industry.

The workshop is keen to have a constellation of scientists and leaders of metallurgical industries to develop a strong vision of how to joint cooperation to help the industry cross technological gaps and achieve a high level of excellence that contributes to achieving regional and international leadership.

President of CMRDI

Prof. Dr. Eamd M Ewais

Keynote speaker

Prof. Ahmed Galal
Former Dean of Faculty of Science, Cairo University
E-mail: galal@sci.cu.edu.eg
Lecture title: Surfaces Design for Green Energy Production

Prof. Galal earned his BSc and MSc degrees in Chemistry from Cairo University, Egypt; and MSc and PhD degrees from the University Of Cincinnati, OH, USA.

He served as member of Strategic Planning and Technical Support Centre, a member of Board of Research for the Ministry of Higher Education & Scientific Research (Egypt). He earned several honors: Graduate Fellowship Award, Quantum Chemical Corporation (USA); Fellowship award of the "Alexander von Humboldt Stiftung," Germany.

He also acted as member in National Committee on New and Advanced Materials, the committee of Basic Sciences both of the Academy of Science and Technology of Egypt.
Professor Galal is a member of the Advisory Board for International Institute for Multifunctional Materials for Energy Conversion (IIMEC), Texas A&M University (USA).
Professor Galal earned State and University of Cairo University Prizes; Appreciation and Excellence in Research in the area of Advanced Materials for Technological Applications.

He authored and co-authored 210 research papers in international renowned journals and delivered over 70 lectures in international conferences and institutes. He supervised several theses that led to both Master and PhD degrees. His research covers a wide spectrum of interests including surface tailoring with nano-structured materials for energy conversion, storage and sensing applications. Synthesis and modification of carbon based nano-structures with emphasis on graphene and carbon nanotubes, and perovskites.

His research deals with the application of conducting polymers and composites in electronic and display materials. Another area of research interest is corrosion prevention and control using smart coating and studies of newly developed super-alloys for advanced applications.

Metallurgical Industries and Future Technology Workshop Program

08:30 - 9:00	**Registration**
	Opening Session
09:00-9:10	Speech of **Prof. Dr. Emad Ewais**, CMRDI President
09:10 - 9:30	Speech of **Prof. Dr. Ibrahim Ghayad**, Dean of the MTI & Work Shop Coordinator
09:30 - 10:00	**Keynote lecture** **Prof. Dr. Ahmed Galal**, Former Dean of the Fac. Of Sci., Cairo University Surfaces Design for Green Energy Production
10:05 -10:25	**Eng. Mohamed Hanafy**, Chairman of the Chamber of Metallurgical Industries Investment prospects in the metallurgical industries
10:25-10:40	**Coffee Break**
	First session **Prof. Dr. Mamdouh Eissa & Eng M. Mohamed Hanafy**
10:40-11:00	**Dr. Mohamed Shalaby**, Ph.D., Egyptian Armed Forces Hard Machining
11:00-11:20	Dennis Snijders-IGS USA & **Houssam Sabry**: ICE Crude Distillation Column Internal Corrosion Control Using Thermal Spray Coating Technology
11:20-11:40	**Eng. Ibrahim Abd El Aziz** – Logistics Executive Manager, Ezz Steel Company Energy Rationalization in Metallurgical Industries
11:40-12:00	**Dr. Ahlam Farouk** - Ministry of Environment -Environmental Affairs Agency Environmental Considerations in the Metallurgical Industries in Terms of Cleaner Production, Green Industry, and Achieving Sustainable Development Goals
12:00-12:20	**Assoc. Prof. Hossam Ahmed Halfa** – CMRDI Modern Technologies in the Steel Industry (Laser Melting, Electroslag Remelting….)
	Second Session **Prof. Dr. Taher Al-Bitar & Prof. Dr. Zainab Abdel Hamid**
12:30-12:50	**Prof. Dr. Walid Mehrez** - Orascom Company Green Hydrogen Road Map in Egypt and the Future Fuel Alteration Strategy
12:50-13:10	**Dr. Heba Ragab** - Arab Organization for Industrialization Solar energy industry in Egypt
13:10-13:30	**Assoc. Prof. Dr. Maha El-Meligy**, CMRDI Thickness Draft for Hot and Cold rolling of locally processed Low-Carbon steel thin sheets for Dietary cans purposes
13:30:13:50	**Prof. Dr. Zahraa ElBaradei** - CMRDI Modern technologies for the development of the non-ferrous metal industry
13:50-14:10	**Exhibitors & Sponsors Session**
14:10-15:00	**Lunch**

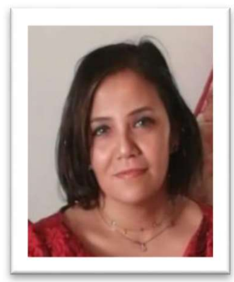
Third session Prof. Dr. Ibrahim Ghayad & Prof. Dr. Azza M Ahmed	
15:00 -15:20	**Eng. Khaled Taha** – Egyptians Iron Co The new technology in MIDA plant
15:20 -15:40	**Dr. Mohamed Al-Gamal**- NACE Cathodic protection and the challenges facing its application
15:40 -16:00	**Eng. Hoda Refaiy** - CMRDI Role of Physical Simulation, Thermo-Mechanical Processes, and Recent Generations of Different Metal Alloys in Sustainable Development
16:00 -16:30	**Dr. Mona Hassan** - CMRDI Industrial applications of superhydrophobic and antibacterial coatings **Eng. Samah Mamdouh** – CMRDI Nickel Selenide as An Electrode Material for Supercapacitor Application
16:20 – 16:35	**Coffee Break**
Fourth Session Prof. Dr. Taher Al-Bitar & Prof. Dr. Zainab Abdel Hamid	
16:35 - 16:50	**Muhammad El Demerdash**, CEO – Engazaat inc Metallurgical Industries and Green Energy Transformation and Our bet on Long Duration Thermal Energy Storage Systems
16:50 - 17:10	**Islam Sameh** ICE Pipelines External Corrosion Direct Assessment- Case Studies and Lessons Learnt
17:10 - 17:40	**Prof. Dr. Ibrahim Ghayad** – CMRDI Development of Mixed Metal Oxides (MMO) Electrodes with High Electrocatalytic Activity for Electrolysis Applications **Dr. F. Abdel Mouez** - CMRDI Manufacture of carbon nanotube (CNTs) from orange peel
17:40 - 18:00	**Eng Hassan Bahaa** – CMRDI An economical and innovative technology for steel production by direct casting
18:00-18:15	**Closing and Recommendation**

Organizing Committee

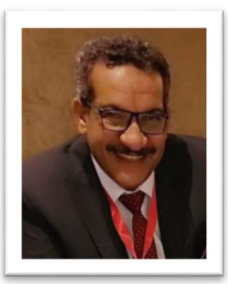
Prof. Dr. Ibrahim Ghayad

Assoc. Prof. Dr. Maha El-Meligy

Assoc. Prof. Dr. Hossam Halfa



Dr. Fatma Abdel Mouez



Mr. Yehia Makhlouf

Eng. Ali Nazier

Eng. Abdalla Ahmed

Mrs. Amina Ibrahim

نبذة عن الورشة

تقام ورشة الصناعات الميتالورجية وتكنولوجيا المستقبل تحت رعاية السيد الاستاذ الدكتور/ محمد أيمن عاشور وزير التعليم العالى و البحث العلمى و السيد الاستاذ الدكتور / عماد محمد عويس رئيس مركز بحوث و تطوير الفلزات ، فى اطار رؤية تعزيز الروابط ما بين البحث العلمى و الصناعة ، ومن خلال تعميق التصنيع المحلي وإيجاد شراكات فاعلة بين الصناعة ومركز بحوث وتطوير الفلزات فى مجال الصناعات الميتالورجية لتحقيق مستوي عال من التميز يسهم في تحقيق ريادة إقليمية ودولية. و سوف تنعقد الورشه يوم الاربعاء الموافق 21 سبتمبر 2022 بفندق هوليداي إن المعادي ، كورنيش النيل ، القاهرة ، في تمام الساعه التاسعه صباحاً.

تهدف الورشة الي تقديم مخرجات مشروعات بحثية صناعية إلي جهات الإنتاج المصرية سواء بقطاع الأعمال العام أو القطاع الخاص وكذلك الصناعات الصغيرة والمتوسطة. كما تهدف الورشه الي الاستماع الي قادة الصناعات الميتالورجية فى مختلف المجالات للتعرف علي رؤاهم والمشاكل والتحديات التي تواجههم ، والتفاعل بين رجال الصناعة والاساتذة الباحثين المختصين لتقديم وإيجاد حلول قابلة للتنفيذ من خلال تعاون بناء بين الصناعة والبحث العلمي فى مجال الصناعات الميتالورجية.

وسوف يتم خلال ورشة العمل عرض للنماذج الناجحة التي قام بها معهد تكنولوجيا الفلزات لتعميق التصنيع المحلي وإيجاد حلول تكنولوجية للمشاكل التي تواجه الصناعة المصرية. وسوف تشتمل الورشة على خمسة محاور لعرض تكنولوجيات حديثة فى مجال صناعة الصلب (الصهر بإستخدام الليزر-إعادة الصهر تحت الخبث،...) ، مجال تشكيل المعادن (تصميم ممرات الدرفله، خرائط التشكيل و القيود، النمذجة و المحاكاة،...)، في مجال صناعة الفلزات الغير حديدية، فى مجال الطلاءات المتقدمة و الحماية من التآكل، مجال ترشيد الطاقة ، مجال الطاقة الخضراء ، والاعتبارات البيئية في الصناعات الميتالورجية.

وفى النهايه سيتم عقد جلسة ختامية للخروج بأهم التوصيات لتفعيل التعاون بين أقسام المهعد مع الصناعة. و تحرص الورشة على وجود كوكبة من العلماء وقادة الصناعات الميتالورجية لوضع رؤية قوية لكيفية التعاون المشترك لمساعدة الصناعة على عبور الفجوات التكنولوجية وتحقيق مستوي عال من التميز يسهم في تحقيق ريادة إقليمية ودولية.

رئيس المركز

أ.د / عماد عويس

ورشة عمل

الصناعات الميتالورجية وتكنولوجيا المستقبل

تحت رعاية معالي

الأستاذ الدكتور / محمد أيمن عاشور

وزير التعليم العالي والبحث العلمي

و الأستاذ الدكتور / عمـاد عويس

رئيس مركز بحوث وتطوير الفلزات

والتي ينظمها

معهد تكنولوجيا الفلزات

بمركز بحوث وتطوير الفلزات

21 سبتمبر 2022 بفندق هوليداي إن المعادي ، كورنيش النيل ، القاهرة

Message of the Dean of the Metals Technology Institute

The Metals Technology Institute (MTI) aims to serve the community and the people involved in research, development and applications related to science and technology for the production of ferrous and non-ferrous alloys and all processes associated with their formation and their surface treatment and protection. We are fully convinced that the industrially oriented scientific research is the primary choice of the MTI. We believe that scientific knowledge is not power in itself, but the application of knowledge is the real power, so we learn to act. In this context, I and my colleagues at the MTI are working to transform this conviction into a tangible reality.

The vision of the Institute of Metallurgical Technology is to achieve integration and scientific cooperation between the departments of the Institute, and to focus on increasing the Institute's contribution to the development of the industrial sector in Egypt, creating new opportunities and participating in the development of the Egyptian economy. In order to achieve the goal of the Institute and put its vision into practice, the Institute undertakes to carry out the following tasks:

- Conducting advanced scientific and applied research and transforming it into an added value for the Egyptian industries.
- Qualifying distinguished researchers in the field of metals technology, and supporting researchers and specialists from all Egyptian universities and companies to take advantage of modern technologies and providing scientific, research and industrial services that support each field.
- Benefiting from the scientific expertise and industrial equipment owned by the Institute to apply advanced technologies for surface treatments, metal forming, production and development of all types of steel alloys, production of non-ferrous alloys such as advanced magnesium alloys for medical uses.
- Transfer of technology, training of engineers and technicians working in the metallurgical industries, and qualifying them to use modern technologies.
- Organizing scientific meetings, workshops and conferences related to the support and dissemination of metallurgy technology.
- International cooperation with all countries of the world to study and absorb the technology of modern metallurgical industries and transfer them to Egypt.

Prof. Dr. Ibrahim Ghayad

Dean of Metals Technology Institute
Email: ighayad@yahoo.com - Mob: 01011607288

Keynote lecture

Surfaces Design for Green Energy Production

Hussein K. Srour, Nada F. Atta, Mohamed W. Khalil, Ahmed Galal

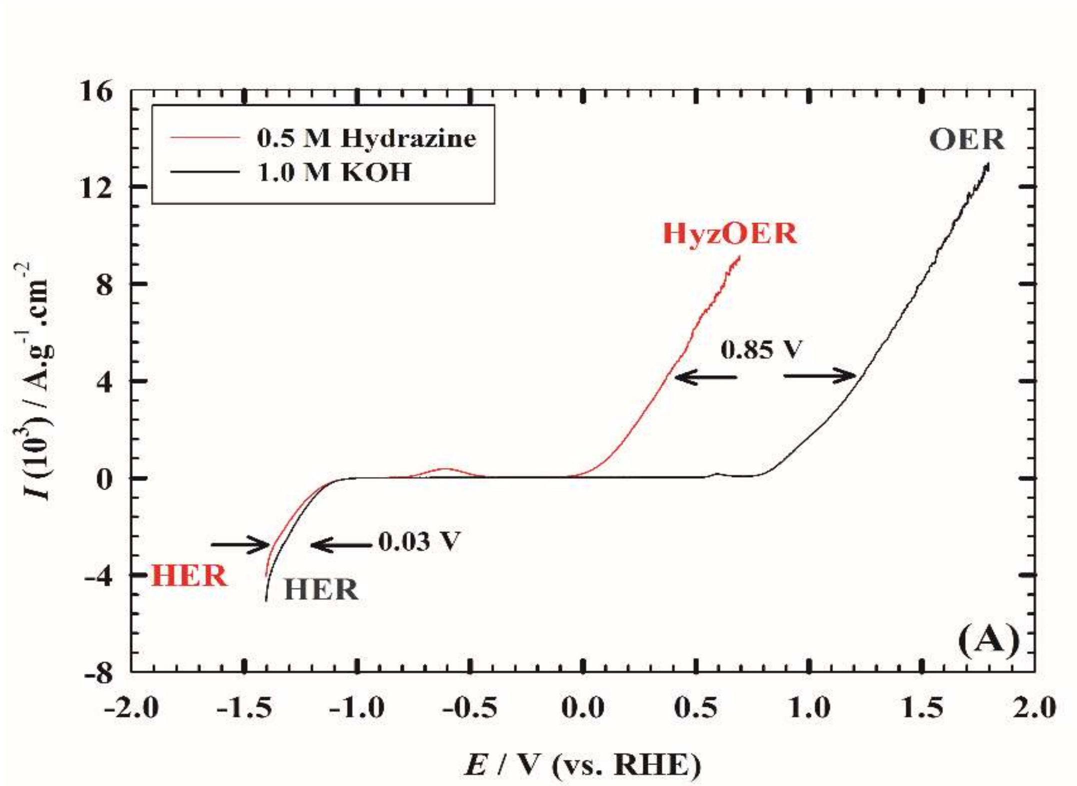
Department of Chemistry-Faculty of Science-Cairo University-12613 Giza-Egypt

galal@sci.cu.edu.eg

Abstract

The energy crisis is escalating worldwide with the scarce of oil supplies caused by war conflict and natural gas demand that outpaces its production. Another challenge is the climate change caused by burning fossil fuels resulting in raising the average earth temperature and toxic gases emission. Short-, medium-, and long-term energy resources are thought to counter these challenges. Hydrogen is considered a prime candidate to remediate this situation, not only because of its large abundance and its relatively high energy content compared to oil and natural gas but also for its "benign" consequences upon its usage.

Research and technical work is currently devoted to produce "green" hydrogen for further adaptation in a clean burning cycle as in fuel cells. In this respect, several electro-catalysts are developed for the electrochemical oxygen evolution reaction, hydrogen evolution reaction and water splitting. An overview of the different catalysts and mechanisms for the water splitting reaction will be presented. Boosting water splitting can also be achieved using a molecular-assisted oxygen evolution reaction approach. The following figure shows the effect of using hydrazine in basic electrolyte to produce oxygen gas.



Linear sweep voltammogram curves of Ni-based composite catalyst in 1.0 M KOH in presence and absence of 0.5 M hydrazine. Scan rate 20 $mV.s^{-1}$.

تعميق التصنيع والفرص المتاحة

مهندس محمد حنفي

مركز تحديث الصناعة

mhanafy@tedata.com.eg

تولي الدولة اهتماما كبيرا ببرنامج التصنيع المحلي وقد قام السيد رئيس الوزراء باستعراض مقترحات البرنامج القومي لتعميق الإنتاج المحلى ، وكذلك الإجراءات التى يتم اتخاذها لتعزيز جهود تعميق الإنتاج المحلى دعماً للصناعة الوطنية، إلى جانب العمل على توطين التكنولوجيا فى مختلف المجالات، بما يسهم فى سد الفجوة بين الصادرات والواردات، وتحقيق الاكتفاء الذاتى من العديد من مدخلات الإنتاج خاصة بعد تداعيات ازمتي الكورونا و الحرب الروسية الاوكرانية و تاثيرهما علي التجارة العالمية و المشاكل اللوجستية و الاسعار ، وذلك فى ضوء توجيهات الرئيس عبد الفتاح السيسي، رئيس الجمهورية، فى هذا الصدد. وقد تم تشكيل مجموعة عمل تضم عدداً من المسؤلين، عقدت العديد من الاجتماعات خلال الفترة الماضية، وذلك بهدف العمل على طرح عدد من الإجراءات التى من شأنها تعميق التصنيع والإنتاج المحلى.

أن البرنامج القومي لتعميق الإنتاج المحلى يستهدف تحقيق العديد من الأهداف الاقتصادية منها ما يتعلق بترشيد وإدارة العجز فى الميزان التجارى، وزيادة حجم الصادرات وترشيد الواردات، بما ينعكس علي توفير النقد الأجنبى، وزيادة المساهمة فى النمو، فضلاً عن إتاحة المزيد من فرص العمل الجديدة.

و تم اتباع منهجية تنفيذ تضمن استدامة واستمرارية برنامج تعميق الإنتاج المحلى المقترح، وذلك من خلال تصميم استراتيجية متكاملة لتعميق الإنتاج، تتضمن تحديد فرص تعميق الإنتاج المحلى وتعظيم الميزة التنافسية، وذلك من خلال التنسيق بين القطاع الخاص والجهات الحكومية، وصولاً لاختيار وتحديد المنتج المستهدف، هذا إلى جانب تحقيق التكامل مع المبادرات الحكومية الحالية من انشاء تجمعات حضارية و برنامج حياه كريمة و الذين يعدا دفعة كبيرة للنشاط الصناعي لتغطية احتياجاتهم ، وتصميم البرامج الفنية والمالية المساندة، والتى تتعلق بالتمويل والتدريب والتنفيذ بما يضمن الاستدامة، فضلاً عن تفعيل برنامج لاختيار الرواد الوطنيين للتنفيذ

أن برنامج تعميق الإنتاج المحلى يتضمن مقترح إنشاء مؤسسة جديدة تتولى القيادة فى تحويل الفرص الاستثمارية المقترحة إلى مشروعات حقيقية على أرض الواقع، والتحرك بها عبر المراحل المختلفة، وذلك بالتنسيق مع كافة الشركاء المعنيين لضمان التنسيق المتكامل بين الجهات الحكومية والقطاع الخاص، وتحقيق أقصى سرعة فى تنفيذ هذه المشروعات، مع توفير سبل للمتابعة الدورية، وتحقيق المزيد من التقدم فى عمليات البحث والتطوير والاستخدام الأمثل للتكنولوجيا والرقمنة فى عمليات التصنيع.

و تم استعراض فرص الاستثمار الصناعي لتعميق التصنيع المحلي بناء علي تكليفات من الرئيس بوضع الصناعة على أجندة الأولويات.. واتخاذ الإجراءات لتوطين مختلف الصناعات و لاتخاذ أي قرارات لتيسير إجراءات استخراج التراخيص لبدء تشغيل مختلف المشروعات الصناعية واستخراج التراخيص المطلوبة للبدء في تشغيل مختلف المشروعات الصناعية.

وخلال الاجتماعات ، تم الاشارة إلى الخطوات التنفيذية التي تم اتخاذها لتشجيع الاعتماد على الصناعة الوطنية، والتي من بينها إعداد قائمة مبدئية للفرص الاستثمارية المتاحة في القطاع الصناعي، والتي يمكن للقطاع الخاص الدخول في شراكات بها، وتشمل 131 منتجا مستهدفا لتوفير البدائل المحلية منها وفقا لاحتياج السوق المحلية وقدرة الصناعة الوطنية على توفيرها، وذلك في ضوء نتائج تحليل هيكل الواردات المصرية، لافتة إلى أنه تم تصنيف تلك المنتجات طبقا لنوعية الاستثمار المطلوبة من حيث كونها استثمارات جديدة أو توسعات لاستثمارات قائمة.

كما تم تفعيل وتحديث خريطة الاستثمار الصناعي كمنصة للترويج لجميع المشروعات والأراضي الصناعية التي تقوم الوزارة بطرحها ووضع الشروط والقوانين والحوافز التي تنظم السياسات الصناعية، وذلك بالتنسيق مع الهيئة العامة للاستثمار والمناطق الحرة.

و من حصر المنتجات المستهدف تعزيز الاستثمارات الصناعية بها 94 مدخل إنتاج تتركز في قطاعات الصناعات الكيماوية، والمعدنية، والنسيجية، والأخشاب، والصناعات الطبية والدوائية، وكذا الصناعات الغذائية، مشيرا في هذا الصدد إلى تفاصيل خطة الاستثمار في القطاعات الصناعية المستهدفة خلال السنوات الخمس المقبلة.

و تم عرض أهم فرص الاستثمار الصناعي والمشروعات الاستثمارية الضخمة المقترح التركيز عليها خلال هذه المرحلة، و قد اعدت تلك القائمة و التي تشمل 131 فرصة استثمارية صناعية بعد حصر اهم الواردات الصناعية و التي بلغت قيمتها 16 مليار دولار و التي تعتبر

مدخلا او خامة او مستلزم انتاج لصناعات اخري كبيرة او متوسطة او صغيرة وتشمل صناعات المواد الخام الكيميائية والبتروكيميائية، وصناعات ألواح الصلب المعدنية والصلب المقاوم للصدأ، وصناعات المركبات الكهربائية والصناعات المغذية لها، والأجهزة الكهربائية والإلكترونية والصناعات المغذية لها، والمحركات الكهربائية، وإنتاج الطاقة الجديدة والمتجددة والصناعات المكملة لها، وصناعات البطاريات وسبل تخزين الطاقة، وأشباه الموصلات، وتحلية المياه والصناعات المغذية لها.و مرفق قائمة بها ورحب المسؤلين بالقائمة المعدة بالفرص الاستثمارية في القطاعات الصناعية المختلفة، وتم عقد سلسلة من الاجتماعات مع مسئولي الشركات المتخصصة في الصناعات المستهدفة؛ لاستعراض امكانياتهم للمشاركة في استغلال تلك الفرص الاستثمارية لما لهم من خبرات في نفس المجال ، مع استعداد للاجتماع معهم في أقرب وقت ومناقشة تلك الفرص المتاحة .. والاستعداد أيضا لتقديم كل صور الدعم لسرعة إنشاء وتشغيل هذه المصانع، وتوفير مستلزمات الإنتاج للصناعات الاخري من مصدر محلي ".

وزارة التجارة والصناعة

مركز تحديث الصناعة IMC INDUSTRIAL MODERNISATION CENTRE

الصناعات الكيماوية	المنظفات السطحية وسوائل التنظيف	منتج تام	توسعات
	ثانى أكسيد التيتانيوم	مدخل انتاج	إستثمارات جديدة
	أضافات زيوت التشحيم	مدخل انتاج	توسعات
	مشروع الملونات العضوية	مدخل انتاج	توسعات
	مشروع بطاريات الليثيوم	مدخل انتاج/ منتج تام	إستثمارات جديدة
	كربونات الصوديوم	مدخل انتاج	إستثمارات جديدة
	البويات والورنيشات فى وسط غير مائى	منتج تام	توسعات
	أدوات مائدة منزلية زجاجية	منتج تام	توسعات
	الكومبرلاند	مدخل انتاج	إستثمارات جديدة
	مشروع أكاسيد الحديدوز	مدخل انتاج	إستثمارات جديدة
	مشروع السيلكون	مدخل انتاج	إستثمارات جديدة
	الإيبوكسى	منتج تام	توسعات
	السوربيتول	مدخل انتاج	توسعات
	بلاستيك الاكريليك	مدخل انتاج	إستثمارات جديدة
	البولى أثيلين جليكول	مدخل انتاج	إستثمارات جديدة
	أحبار الطباعة	مدخل انتاج	توسعات
	الرانتجات الأمينية	مدخل انتاج	توسعات
صناعات مواد البناء والصناعات المعدنية	مشروع ألواح الصلب المعدنية	مدخل انتاج	توسعات / إستثمارات جديدة
	الصاج المقاوم للصدأ - الإستانليس ستيل-	مدخل انتاج	إستثمارات جديدة
	لوازم المواسير والدنابيب	مدخل انتاج	توسعات / إستثمارات جديدة
	مسامير وصواميل	مدخل انتاج/ منتج تام	توسعات / إستثمارات جديدة
	مواسير وأنابيب غير ملحومة	مدخل انتاج/ منتج تام	إستثمارات جديدة
	زوايا وقطاعات	مدخل انتاج	توسعات / إستثمارات جديدة
الصناعات الهندسية	الهواتف المحمولة	منتج تام	توسعات / إستثمارات جديدة
	مشروع حنفيات منزلية	منتج تام	توسعات / إستثمارات جديدة
	مضخات سوائل	منتج تام	توسعات / إستثمارات جديدة
	مشروع الكباسات	مدخل انتاج	إستثمارات جديدة
	أجزاء ومكونات الجرارات وسيارات النقل	مدخل انتاج	توسعات / إستثمارات جديدة
	جرارات الجر (زراعية + مقطورات)	منتج تام	توسعات / إستثمارات جديدة
	مشروع المحركات الكهربائية	مدخل انتاج/ منتج تام	توسعات / إستثمارات جديدة
	خلايا الطاقة الشمسية	مدخل انتاج	إستثمارات جديدة
	تشيلر للتكييف المركزي	منتج تام	توسعات / إستثمارات جديدة
	كمبيوتر لوحي (تابلت)	منتج تام	توسعات / إستثمارات جديدة
	الصمامات الصناعية (صمامات عدم الرجوع)	منتج تام	توسعات / إستثمارات جديدة
	مشروع أجهزة لغسل الأواني المنزلية	منتج تام	إستثمارات جديدة
	أجزاء أجهزة الغسيل التجارية	مدخل انتاج	توسعات / إستثمارات جديدة
	أدوات مائدة وأدوات مطبخية	منتج تام	توسعات / إستثمارات جديدة
	مراجل وغلايات	منتج تام	توسعات / إستثمارات جديدة
	مشروع منظمات الحرارة	مدخل انتاج	إستثمارات جديدة
	مشروع قوالب المطاط أو اللدائن (اسطمبات)	مدخل انتاج	توسعات / إستثمارات جديدة
	مرشحات السوائل (الزيت والبنزين)	مدخل انتاج	توسعات / إستثمارات جديدة
	مشروع أقفال الاثاث (مغاليق للابواب والشبابيك)	مدخل انتاج	توسعات / إستثمارات جديدة
	إكسسوارات الاثاث	مدخل انتاج	توسعات / إستثمارات جديدة
	الدوائر المطبوعة (PCB)	مدخل انتاج	توسعات / إستثمارات جديدة

www.imc-egypt.org   IMC - مركز تحديث الصناعة   info@imc-egypt.org   imcegyptorg

First Session

Chairman

Prof. Dr. Mamdouh Eissa

Eng M. Mohamed Hanafy

Hard Machining

Mohamed Shalaby
PhD, Egyptian Armed Forces
mohamedlovesegypt@gmail.com

Abstract:

Hard turning has been technically and economically competitive with grinding. Traditionally, steel parts are produced by a sequence of technological processes, which may include time-consuming and costly grinding. The production of molds and dies involves conventional machining in the soft state, followed by heat treatment. All these steps have a lead time, which was estimated to consume approximately two-thirds of the total manufacturing cost. So, hard turning at such cases may be a viable process that could have potential economical benefits.

For considerably small un-deformed chip thickness used in hard machining, the ratio of the cutting edge rounding radius to the un-deformed chip thickness tends to be high. The higher the ratio is the higher the specific cutting pressure and consequently the larger the cutting force, a phenomenon known as the "size effect" of the cutting edge. However, mechanistic and thermal models will be presented to explain the encountered phenomena.

Moreover, the wear mechanisms of the used tool materials in hard machining will be studied to decide upon the most proper cutting tool material for different work piece materials.

Some tribological aspects induced during the machining of hardened steels and hardened nickel-based super alloys will be also investigated during this study.

Keyword: Wear; Tool material; Hard machining

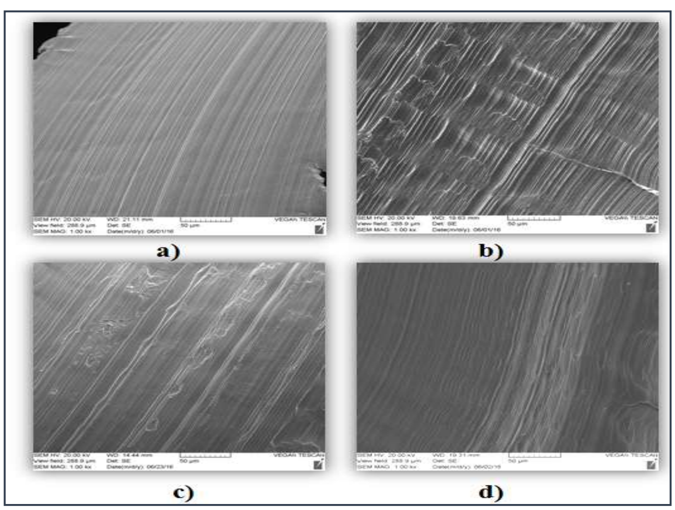


Fig. (1) Wear profile on the surface of the investigated material

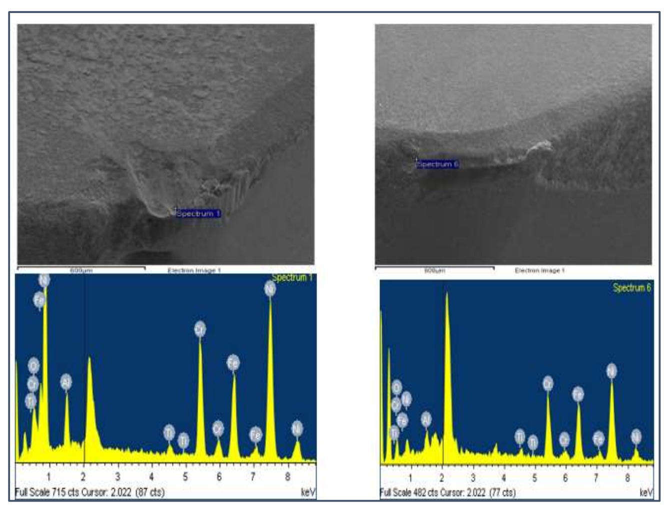


Fig. (2) Microanalysis of formed turning

Crude Distillation Column Internal Corrosion Control Using Thermal Spray Coating Technology

Houssam Sabry (ICE MD), Dennis Snijder (IGS- Regional Manager)

Email: houssam@ice.com.eg

Abstract:

In a world of high geopolitical volatility, the oil and gas markets have seen high fluctuations in prices and in the supply and demand. The Egyptian state has put an ambitious strategy to duplicate the capacity of its refining, hence, locally securing the fuel supply for the local markets.

This strategy necessitated ensuring the reliability of the existing refineries in addition to constructing new refinery units.

Among these new units is the Crude Distillation Unit #4 which was to be built in the city of Suez for one of the major operators. To reduce the capital cost, EGPC utilized some of the mothballed equipment available in Alexandria which was intended for one of the projects which at that time wasn't feasible. Among these equipment was the Main Fractionator Column and the Preflash Column.

ICE was awarded some of the engineering areas among which Materials Selection was being done by ICE. On doing the materials selection, it was found that the available Main Fractionator and the Preflash Column will not satisfy the design life of 20 years due to the nature of the unit feed crude.

The materials selection of course need to be based on the optimal lifecycle cost and the best OPEX vs CAPEX analysis. Several technoeconomic alternatives were studied, among the options was to utilize the unique technology of High Velocity Thermal Spray (HVTS) Thermal Spray Coatings (TSC) which is patented to IGS, USA.

Together with the project team IGS did a complete internal TSC using C-276 alloy. Design lifetime shall exceed 20 years.

In this presentation we shall speak about this success story and innovative solution.


SULZER

Energy Rationalization in Metallurgical Industries

Ibrahim Abd EL Aziz

Ezz Steel logistics executive manager

a-aziz@ezzsteel.com

Abstract:

Growth of world economy led to increase in energy demand, studies shows that by 2050 global needs of energy will be doubled, consequently emissions with harmful impact on our fragile environment ,climate change, polar melting and (GHG) that threaten life quality increased so, strict measures to reduce adverse effect of emissions taken , beside world economy hit by multiple crisis , covid -19 ,conflicts and wars cause interruption in resources supply chains , increasing energy demand with energy resources scarcity led to significant increase in energy prices , being the 2nd power consuming industry where energy represent 20:40 % from cost and a heavy CO_2 producer, metallurgical industries especially iron and steel actively manage energy consumption to ensure competitiveness of the industry and to reduce environmental impacts, continuous improvement result in reducing energy requirements by 60%,since 1960 many techniques applied to steel industry to reduce energy consumption and to make use of produced heat during steel production , in steel making power consumption highly affected by production route (Bo-BOF/EAF), production capacity , DRI to scrap ratio ,additives and raw material quality , steel and billet grade to be produced, Exergy analyses is a useful tool to manage both energy and material quality already applied successfully in this field

efficient power usage and techniques that rationalize energy consumption in steel production aren't an option anymore, they become mandatory and still need a strict energy management system for better awareness and system sustainability.

Keywords: Energy, metals, cost

Table (1) energy consumption of main steel production routes

Energy intensities of main production routes

Methodology	BF-BOF	Scrap-based EAF	Natural gas-based DRI-EAF
IEA	21.4 GJ/t	2.1 GJ/t	17.1 GJ/t
worldsteel	22.7 GJ/t	5.2 GJ/t	21.8 GJ/t

Note: worldsteel reference values are adjusted to match the IEA "crude steel boundary" described above. Differences between the IEA and worldsteel values shown here are mainly attributable to the treatment of electricity.

Table (2) CO_2 emissions of main steel production routes

CO_2 emission intensities of main production routes

Methodology	BF-BOF	Scrap-based EAF	Natural gas-based DRI-EAF
IEA (direct)	1.2 t CO_2/t	0.04 t CO_2/t	1.0 t CO_2/t
IEA (direct + indirect)	2.2 t CO_2/t	0.3 t CO_2/t	1.4 t CO_2/t
worldsteel	2.2 t CO_2/t	0.3 t CO_2/t	1.4 t CO_2/t

Note: worldsteel reference values are adjusted to match the IEA "crude steel boundary" described above.

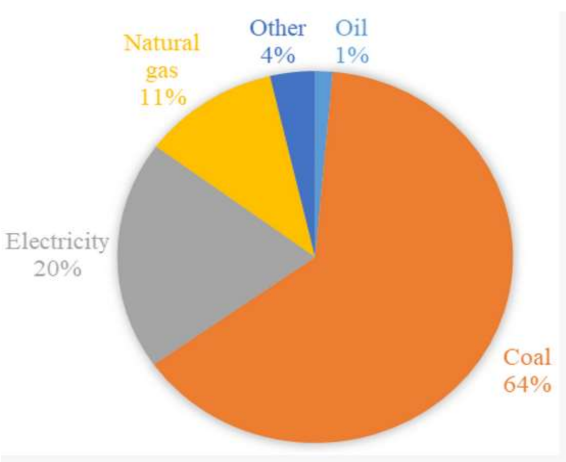


Fig. (1) Energy structure of the global steel industry

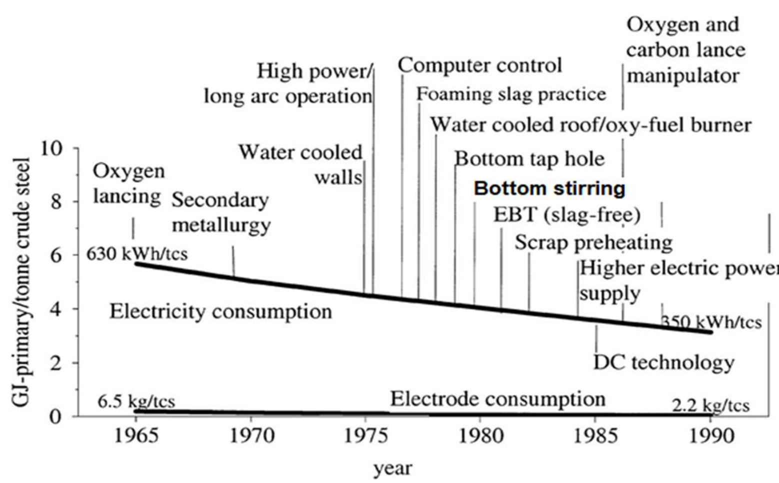


Fig. (2) EAF route electricity and electrode consumption improvement due to different techniques

Environmental Considerations in the Metallurgical Industries in Terms of Cleaner Production, Green Industry, and Achieving Sustainable Development Goals

Ahlam Farouk

Ministry of Environment

Email: afarouk2002@yahoo.com

Abstract:

The question that arises is: How can the pollution caused by the existing industries be dealt with and their effects on human health and the environment be reduced?

To answer this question, we must know that the environmental effects of the industry vary according to the type and size of the industry, and to be able to deal with industrial pollution and reduce the effects of pollutants on human health and the environment, the type and quantities of these pollutants must be accurately identified so that the appropriate practical ways to deal with them can be identified When the completed project enters the operational phase, the environmental concern becomes one of the concerns that ensure that the project conforms to the previously defined standards, and it does not include only the standards that apply to the project's effects on its external environment, but also any other standards that are necessary to ensure the safety and health of workers working on the project and the population in the areas surrounding it.

Many industries in developed and developing countries have worked on diagnosing their environmental impacts to develop the best practical means and use the best available technological methods to deal with and reduce these effects.

Because of the increasing interest in environmental issues and the emergence of the concept of sustainable development with the crystallization of new concepts in the same context, industrial establishments found themselves forced to bear responsibility for the damage they cause to the environment as a result of their various activities, and the multilateral pressures that these establishments are exposed to, which aims to create an environment free of Pollution and more efficient use of environmental resources and energy, has led decision-makers to realize the importance of including environmental management and cleaner production technologies within the enterprise's strategy, to properly manage environmental issues within the framework of environmental laws and environmental policies, which contributes to addressing environmental problems.

One of the most important problems that have been caused to the environment and resulting from industrial activities is environmental pollution, which expresses an imbalance in the balance of the components of the environment as a result of the addition of harmful substances that change the properties of these elements. At the source and treating its output at the end of the pipe, to highlight the role of cleaner production in protecting the environment from pollution in practice, and cleaner production technologies ensure that pollution is prevented at the source and works to treat it if it occurs.

Hence, the importance of the workshop lies in the growing environmental awareness among stakeholders, which necessitated the need to shed light on cleaner production technologies that contribute to reducing the various environmental impacts on humans and the environment, as it helps to reduce it at the source instead of working to treat it when it occurs.

Industrial progress has led to the depletion of natural resources by treating them as free goods found in nature and has also caused pollution to the environment with waste dumped in various shapes and huge sizes. Environmental pollution is one of the phenomena that has taken a great deal of attention from the governments of the countries of the world since the second half of the twentieth century, and it is one of the most urgent environmental problems that have begun to take serious environmental, economic and social dimensions, especially after the industrial revolution in Europe and the massive industrial expansion supported by modern technology. In recent times, industries have taken many and varied trends, often accompanied by dangerous pollutants that often lead to the deterioration of the biosphere and the elimination of environmental systems. They also ignored the rationalization of the exploitation of natural resources and sought to achieve profit primarily at the expense of the environment and the resources in it, which threatened to deplete These resources and their damage as well as was one of the main causes of climate changes that humanity is now experiencing. Cleaner production is one of the modern concepts that accompanied the emergence of the concept of sustainable development, and it aims to integrate environmental considerations into the production process before and after it and throughout the life cycle of the product. This concept will prevent damage to the environment and not work to repair the damage after the fact. It is common for cleaner production that it is expensive and it is difficult to implement in developing countries because of the high cost of investment in environmental technologies.

The cleaner production strategy is one of the latest developments in environmental thought in the last two decades.This strategy extends from significantly reducing the consumption of environmental resources, to avoid the use of hazardous materials that are highly toxic or harmful to the environment as much as possible, and raising the efficiency of product design and production methods to achieve these two goals, then reducing emissions, discharges, and waste during the production process and waste recycling. Nanotechnology is a tremendous advance in cleaner production technology represented in reducing industrial waste and then eliminating industrial pollution and improving the efficiency of the use of available economic resources until it reaches the point of considering the system of social values that resulted in the demand for products or services, and in this context there are two main factors that represent an advantage For many developing countries, including Arab countries,

Modern Technologies in the Steel Industry (Laser Melting, Electroslag Remelting….)

Hossam Ahmed Mohamed Halfa

Associate Prof. Dr at Steel Technology and ferroalloys Department, Central Metallurgical R&D Institute (CMRDI), Helwan, Egypt

hossamhalfa@gmail.com, dr.hossam@cmrdi.si.eg

Abstract:

The mechanical properties of high technological steel did not depend only on their chemical composition and heat treatment but also on the production technologies. Modern technologies utilized for the primary melting of these types of steels include induction furnaces with injection facilities, vacuum induction melting, skull induction melting, and high-pressure induction melting. While refining the produced steel ingots using secondary refining processes, such as laser melting, vacuum arc remelting (VAR), electron beam remelting (EBR), plasma arc remelting (PAR), or electroslag remelting (ESR).

High technological steels such as Maraging steel and high-speed tool steels require sophisticated production technology. The properties of Maraging steel and high-speed tool steels depend mainly on the production and refining technology which affect the recovery and homogeneity of alloying elements in addition to the cleanness of the produced steel.

Electroslag refining (ESR) is an attractive and feasible secondary refining process due to its economy and powerful effect in decreasing the steel content of nonmetallic inclusions, gases, and sulfur. Mechanical properties enhancement because of improving steel cleanliness, soundness, and homogeneity. Additionally, the ESR has a pronounced effect on the as-cast structure because of the positive influence of decreasing the local solidification time of the molten metal resulting in the formation of fine carbides rich in alloying elements and carbon.

Due to the increasing environmental issues and continuous depletion of fossil resources, the steel industry faces extraordinary pressure to diminish CO_2 emissions and accomplish sustainable energy growth. The annual production of steel worldwide amounted to about 1.8 Gt in 2018. The iron and steel production with current technologies requires large amounts of coal. Production of 1 ton of steel releases about 1.85 tons of CO_2 on average emissions into the atmosphere. The worldwide use of fossil fuels for electricity generation, transport, heating, and industry usually releases about 37 gigatons (Gt) of CO_2 annually. A significant part of these emissions, about 3.3 Gt CO_2, or 9 % of all CO_2 emissions, can be attributed to the iron and steel production industry. Decarbonization in this industry will be a milestone in the overall effort toward reaching net-zero emissions shortly. Hydrogen is considered the most promising clean energy in the 21st century because of its diverse sources, high calorific value, good thermal conductivity, and elevated reaction rate-making hydrogen have great potential to apply in the steel industry.

This work aims to speak in brief for the new technologies utilized in the production of high technological steel, such as laser melting (LM), vacuum arc remelting (VAR), electron beam remelting (EBR), plasma arc remelting (PAR), or electroslag remelting (ESR). Also, this work aims to take a look at the importance of utilizing new energy sources, such as green hydrogen.

Keywords: High technological steel; production of steel, melting, refining.

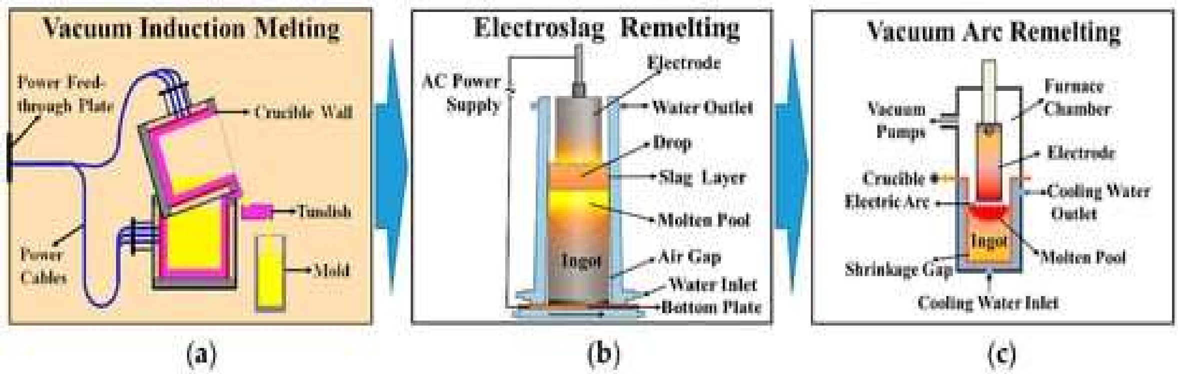
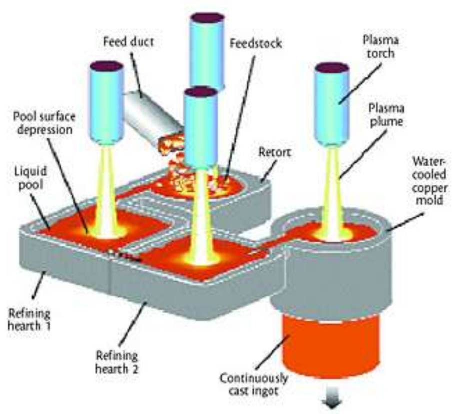


Fig. (1) Production of high technological steel alloys

a)



b)

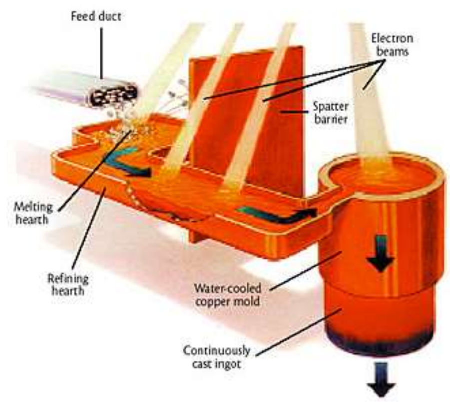


Fig. (2) Plasma arc remelting and electron beam remelting

Fig. (3) Green hydrogen in the iron and steel industry

Second Session

Chairman

Prof. Dr. Taher Al-Bitar

Prof. Dr. Zainab Abdel Hamid

Green Hydrogen Road Map in Egypt and the Future Fuel Alteration Strategy

Dr. Eng / Waleed Alsayed Mohrez

Associate professor of nuclear construction Materials at the Egyptian Nuclear materials Authority of Egypt.

Email: dalywaleed@hotmail.com Mobile:01270590755

Abstract:

Egypt has a revolutionary tendency towards the fueling strategy by changing the carbonized gases and using hydrogen in place of traditional gases in this surveying study we will show the current status of the Green Hydrogen Project as forward and backward integrity starting from the generation of the hydrogen from renewable energy and using it as fuel for Production the green ammonia inside the battery limit of Egyptian Fertilizers Company, such project is being constructed by Orascom and developed by Scatec company we will survey the current status and the future of Green Hydrogen in Egypt at near future.

Photovoltaic Solar Panels Manufacturing in Egypt

Heba R. Abd El-aaty[1]

1Arab Renewable Energy Company, Arab Organization for Industrilazation, Egypt,

eng_heba_ragab@yahoo.com, hebaragah@gmail.com

Abstract:

The silicon PV solar cells are amongst the most developed and widely known technologies for solar cells**.** The main features of using solar cells for producing the electric current are that the sun light is a permanent source of energy compared with the fossil fuels, they also can produce the electric current without producing any carbon emissions to achieve Egypt vision 2030 and The National Strategy for Climate Change in Egypt 2050. This work present the PV solar cells various types according to the production techniques.

In this work I demonstrate the first versus the second generation (c-si, thin film) solar cell in Egypt technically and market study comparison. The first generation solar cell is based on the silicon wafer. It is the most prevalent type due to its high efficiency, but it consumes a huge energy due to its manufacturing techniques. The first generation PV solar cells stages are shown in Figure 1.

The last stage only is manufactured (from cell to module) in Egypt till now. Here I illustrate PV solar panel manufacturing situation in Egypt and the development plans in this sector. There are eight companies produced the 1st generation solar panel (poly-c-si and mono-c-si).

ARECO PV production line with all its stages is mentioned as a case study of the production line in Egypt and its future vision for solar panel manufacturing to deepen local manufacturing. Finally ARECO running researches is illustrated.

Keywords: c-si, thin film, PV solar cell, ARECO, deepen local manufacturing.

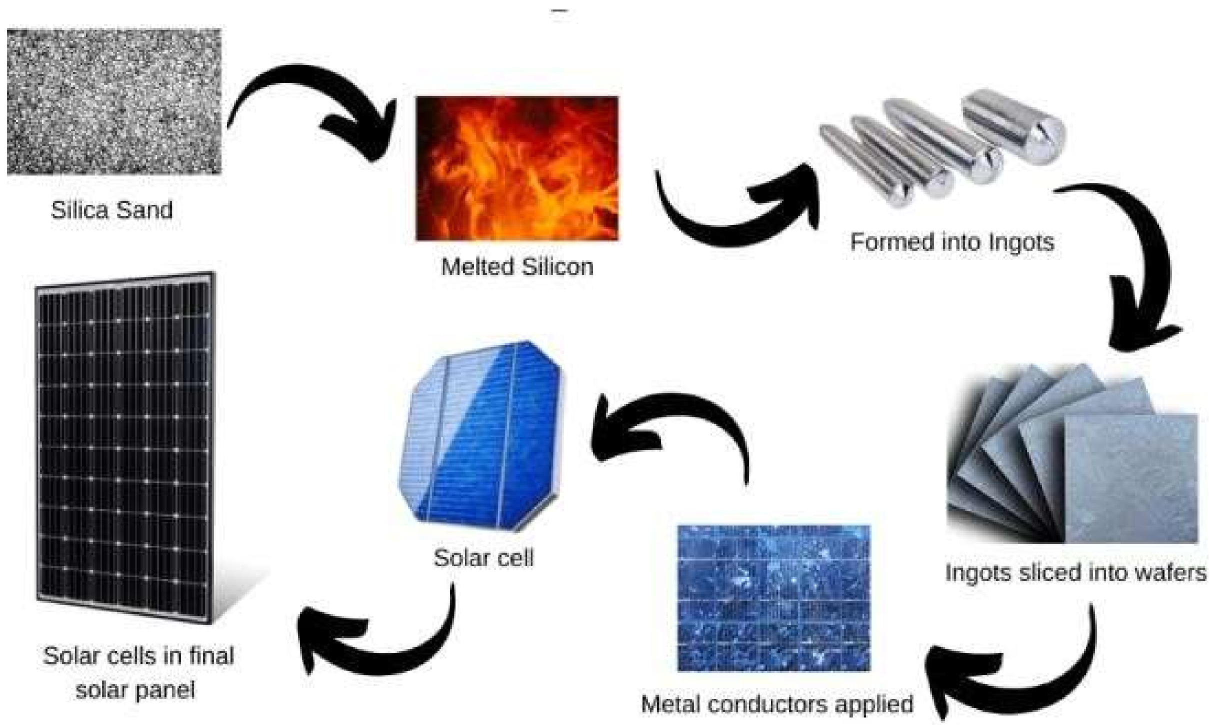


Fig. 1: first generation PV solar cells stages

Thickness Draft for Hot and Cold rolling of locally processed Low-Carbon steel thin sheets for Dietary cans purposes

Maha El-Meligy[1] and Taher El-Bitar[2]

[1]Associate Professor at Plastic Deformation Department, CMRDI
[2] Professor at Plastic Deformation Department, CMRDI

Email: dr.mahaelmeligy@gmail.com

Abstract:

The project aims at exploring successful conditions for hot and cold processing of locally processed Low-Carbon (0.04% C) thin sheet steel (0.4 mm) for dietary cans. The primary material of the proposed project is a low- carbon containing steel produced by the compact slab casting- direct hot rolling. The slabs have 75 mm thickness and are subjected to a roughing stage to reach 31 mm thickness. After roughing, the steel strips are subjected to 6-passes consecutive finish hot rolling to acheive 3.1 mm thickness, with a thickness reduction 58.7%. Thermo-mechanical simulation would be used to detect the favored dynamic recrystallization conditions. Fig. 1 presents thermo-mechanical simulation results from a previous work detecting accumulated dynamic recrystallization after the peack stress.

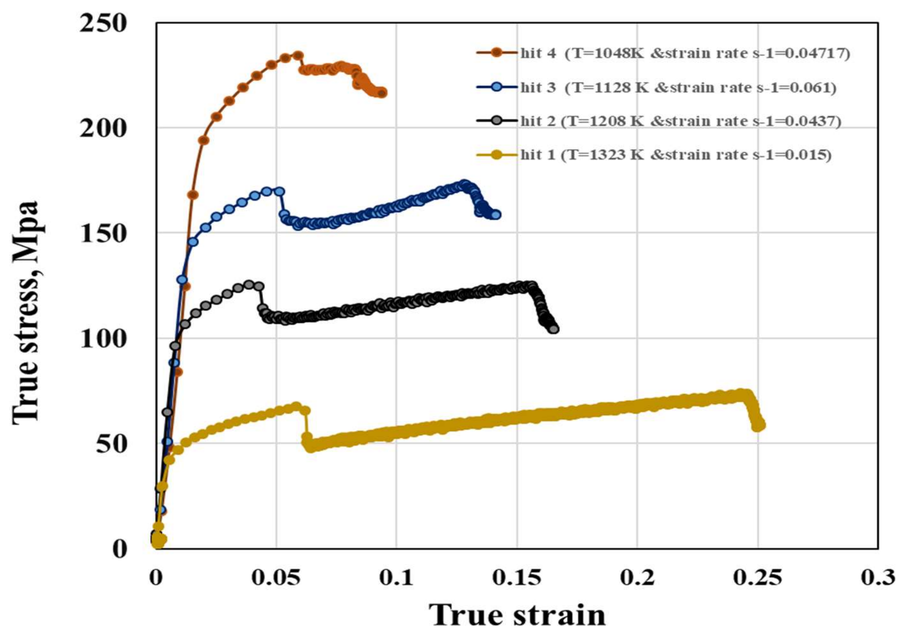


Fig. (1) Thermo-mechanical simulation results detecting accumulated dynamic recrystallization

A continuous pickling step is then needed before cold rolling to get rid of the surface hot rolling scales. Consecutive multi-pass cold rolling would be achieved by a designed thickness draf to reach 0.4 mm thickness. The optimum no. of cold rolling passes would be also calculated. A physical simulation by sing hit cold-upsetting would be used to detect the optimum point for essential intermediate annealing. Fig. 2 presents selected results from a previous work detecting the strain hardening stages and the optimum point for intermediate annealing.

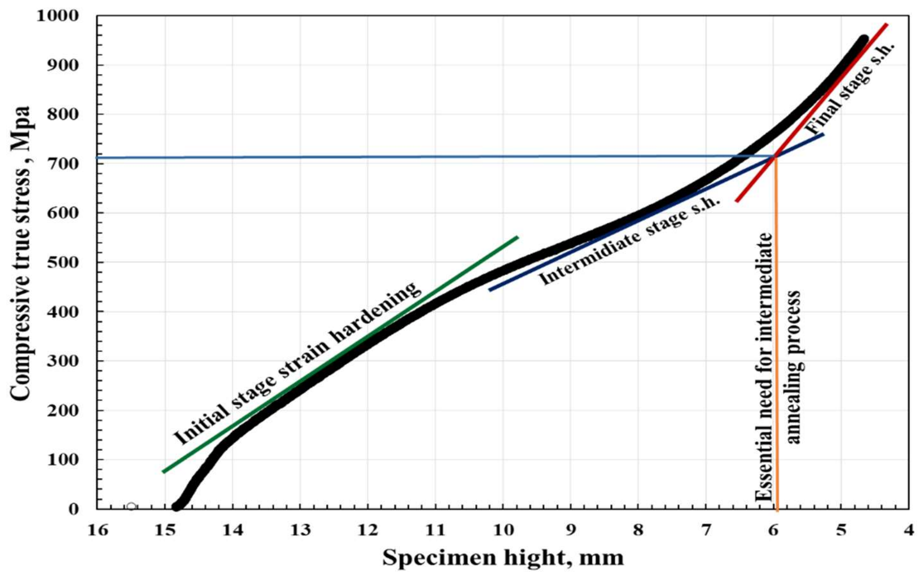


Fig. (2) Selected results of cold upsetting from a previous work detecting the strain hardening stages and the optimum point for essential intermediate annealing.

The project phases would achieve thickness draft regimes to fulfill the requirements of essential finite dimensions and successful mechanical properties. It is supposed that the thin sheets would be suitable for surface coating. It will be a good opportunity to initiation cooperation between multi-disciplinary parties.

Keywords: Thickness Draft, Hot and cold rolling pass design, thermos-mechanical simulation. Dynamic recrystallization, single het Cold up-setting physical simulation. processing constraints, finite thin sheets dimensions, Dietary cans.

New Technologies for the Development of the Non-Ferrous Metals Industries

El-Zahraa El-Baradie

Prof and Head of Non-Ferrous Dept in CMRDI

Email: zelbaradie@gmail.com

Abstract:

Products of the non-ferrous metals industry are in high demand in absolutely all sectors because the demand for metals is growing from year to year. Non-ferrous metals are used in the aerospace, automotive, and military manufacturing industries, in electronics and instrument manufacturing, in machine-building, in the medical industry, and for the manufacture of various household devices and appliances. Successes in nuclear and aerospace technologies are directly related to the use of many non-ferrous and especially less common and rare metals. The non-ferrous metals industry, like any other sector of industry, has many specific and unique technical and economic features. The development of non-Ferrous industries is divided into two sectors: The first one is material design in which new material can be designed to be used in a suitable for advanced applications such as foam metals. Foam metals are used for automotive and biomaterial applications, Fig 1. Introducing innovative metals with new chemical compositions such as Ti-Nb-Mo and magnesium alloys instead of Ti-4V-6Al alloy in biomaterial applications and also high-performance materials which are the key drivers to boost the safety and performance of devices in multiple engineering sectors. The second sector in the development of non-ferrous industries is the development of devices used in production, especially in this time when software technologies have become dominant in all means of production and industry. In this area, computer simulation of solidification processes using CAD/CAM system is the evolution of a solidification technology. Also, additive manufacturing (AM) is a new technology, Fig. 2. The term AM encompasses many technologies including subsets like 3D Printing, Rapid Prototyping (RP), Direct Digital Manufacturing (DDM), layered manufacturing, and additive fabrication.

Keywords: Foam metals, new material design, computer simulation, additive manufacturing, 3D printing

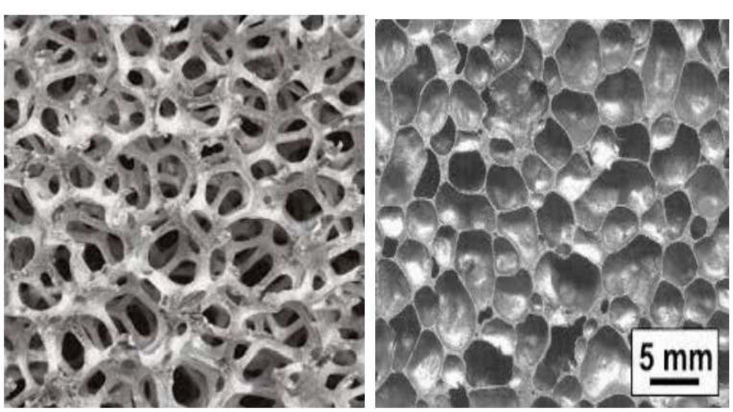


Fig. (1) Open cell and closed cell foam metal

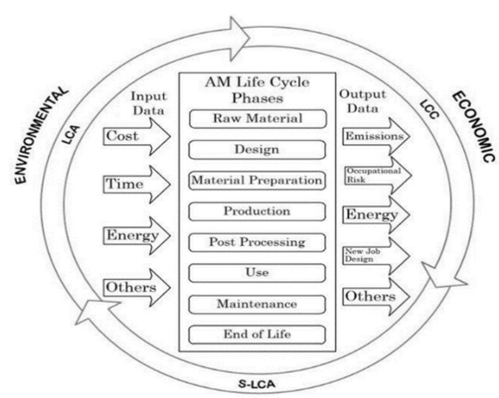


Fig. (2) The proposed framework for assessing the impacts of AM technologies

Third Session

Chairman

Prof. Dr. Ibrahim Ghayad &
Prof. Dr. Azza M Ahmed

The new technology in MIDA plant

Eng. Khaled Taha

Plant general manager (Al Ein Sokhna Plant) Egyptian Steel

Email: khaled.taha@egyptian-steel.com

Abstract:

The presentation Summary

- What MIDA means?
- MIDA Concept and application
- MIDA technology History
- Process flow chart
- Melt shop
- Continuous Casting Machine
- Hot Rolling Mill (HRM)
- MIDA Plant Advantages
- Environmental benefits Thanks

Cathodic Protection and the Challenges Facing Its Application

Mohamed Elgamal

Ph.D., Operation Services Manager in The Arab Petroleum Pipelines Company (SUMED)

Email: mohamedelgamal@osumed.org

Abstract:

Cathodic protection (CP) is an essential part of the corrosion prevention plan for any offshore structure including fixed structures, pipelines, subsea equipment, floating structures, and ships. The presentation will address the advances in the cathodic protection of offshore structures, e.g. wireless power supply, and impressed current mixed metal cathodic protection systems. Topics to be reviewed are:

1. Cathodic protection design fundamentals
2. Cathodic protection of offshore structures
3. New technologies in cathodic protection power supplies
4. CP interference problems and its overcome.

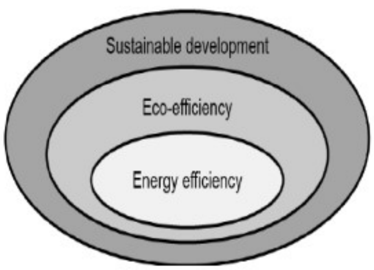
Role of Physical Simulation, Thermo-Mechanical Processes, and Recent Generations of Different Metal Alloys in Sustainable Development

Eman El-Shenawy*, Hoda Nasr El-Din, Ahmed I.Z. Farahat, Hoda Refaiy

*E-mail: huda_refaiy@yahoo.com, Mob: 01005618799

Abstract:

Resource consumption is rising rapidly, driven by population growth and rising wealth. These growing concerns about escalating resource extraction and disposal have contributed to the now widely accepted concept of sustainable development, which is broadly defined as development that meets the needs of the present without compromising the ability of future generations to do the same. This will require significantly improved efficiencies in the use of resources and also major reductions in waste generation and emissions to break the link between economic expansion and resource consumption. One way to achieve greater efficiency in resource use is the reduction in the amount of energy and materials required to serve economic functions. Metal alloys are fundamental for developing present-day societies, so world economies have become highly dependent on these resources. The exploration, extraction, and metal processing activities can contribute to sustainable development goals by creating wealth and helping to alleviate poverty, particularly in remote and regional areas, as well as improving health, education, and the standard of living for communities. Among such measures as oil consumption reduction and emission cuts in the automobile industry, more attention has been attached to making the material in the car body lighter by enhancing properties and performance. Statistically speaking, each 10% weight loss could save 3–7% fuel and 13% CO_2.

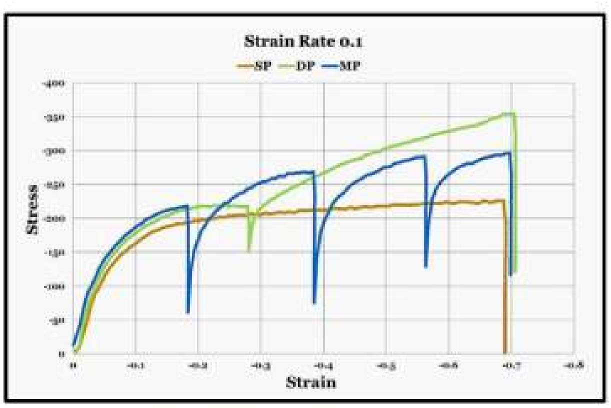


Moreover, physical simulation and thermo-mechanical processes are considered effective methods to develop recent metal alloys with the possibility of consuming lower energy. This is because the physical simulation of materials processing involves the exact reproduction of the thermal and mechanical processes in the laboratory scale to which the material is subjected in the actual fabrication or end-use. Additionally, thermo-mechanical processing comprises the replacement of conventional rolling plus post-rolling heat treatments by integrated controlled forming and cooling strategies. This is important for reductions in energy consumption, increases in productivity, and more compact facilities in the steel industry. The plastic deformation department at CMRDI plays an influential role in achieving sustainable development requirements and the vision of Eygpt 2030. Where there is more than one research group, who are hardly working on developing recent and advanced metal alloys by firstly optimizing experiment using numerical simulation (i.e., Thermo-Calc and J-Mate Pro software), physical simulation via Gleeble-

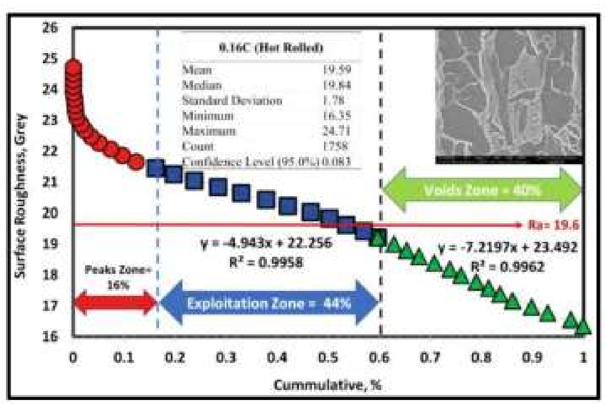
3500 Machin, which is available in department labs, then performing final experiments at optimal conditions in the pilot.

Thermo-Mechanical simulators Gleeble 3500

Recently, researchers at the department have been focusing on developing different advanced metallic alloys, including nonferrous alloys (i.e., Titanium, Aluminum, and Magnesium alloys) as well as the Third generation of advanced high-strength steel, which exhibited excellent tensile properties. These advanced types of steel include TRIP Steel with Bainitic Ferrite Matrix, Ferritic Bainitic Dual Phase steel, TWIP steel, and Quenched and Partitioned Steel for structural applications in industries such as automotive. These studies also provide the processing technology packages of these alloys to be applied on an industrial scale. Additionally, the researchers are interested in investigating the surface texture behavior of different metal alloys using the Abbott Firestone curve depending on MATLAB software to give a comprehensive point of view about the alloy's behavior during operating conditions. Thermo-Mechanical simulators Gleeble 3500 Flow stress-strain curves of the single-, double-pass, and multi-pass TMCP strategies Abbott Firestone curve of low-carbon steel after hot-rolling and heat-treating processes



Flow stress–strain curves of the single-, double-pass and multi-pass TMCP strategies



Abbott Firestone curve of a low-carbon steel after hot-rolling and heat-treating processes

Industrial Applications of Superhydrophobic and Antibacterial coatings

Mona .H. Gomaa[1], Maamoun. A. Maamoun[1], Ibrahim M. Ghayad[1], Z. Abdel Hamid[1]

1: Corrosion Control & Surface Protection Department, Central Metallurgical Research and Development Institute, Helwan 11421, Egypt

Email: monahasan@cmrdi.sci.eg

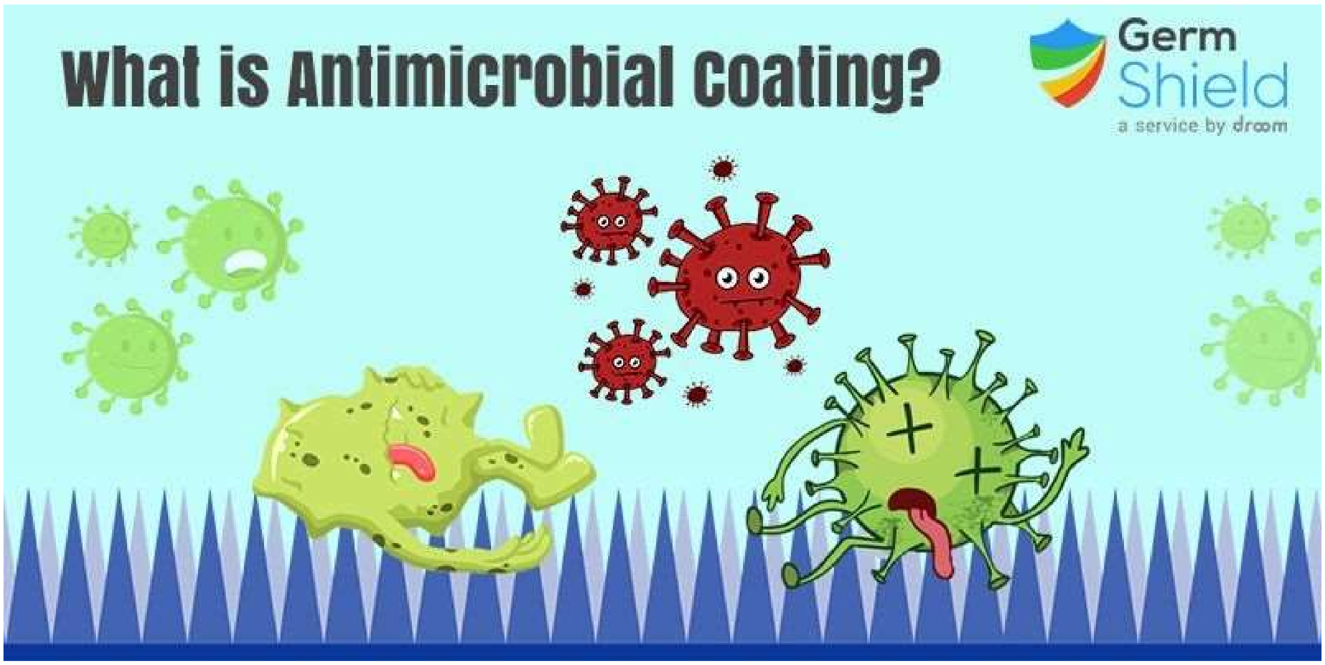
Abstract:

Superhydrophobic (SH) surfaces are those with apparent contact angles with water ≥150 and little contact angle hysteresis. Because of their low surface energy and unique roughness, superhydrophobic surfaces are exceptionally effective at repelling water. Due to their distinct water repellency, self-cleaning, and anticontamination characteristics, superhydrophobic surfaces have recently received a lot of attention.

These surfaces are employed in a variety of different application fields, such as self-cleaning, corrosion resistance, anti-icing, anti-fouling paints for boats, anti-bacterial adhesion, windshields, textile industry for the production of water and fire-resistant clothing and coatings for architectural surfaces. There are other benefits in addition to the wide range of uses, such as a decrease in maintenance costs, the removal of tedious manual labor, and a reduction in the time required to clean the finished product.

Hospital-associated diseases, food deterioration, and equipment fouling are all negative effects of bacterial colonization. Antibacterial coatings may offer a solution, and "smart" coatings are a growing area of research. Despite the broad definition of smart coatings, smart antibacterial coatings are those that can manifest or change their antibacterial activity in response to a stimulus.

Due to its remarkable antibacterial qualities, Ag NP is an efficient material that has been widely used. Pure Ag NPs can have decreased activity over time because they are susceptible to environmental variables like heat, light, and pH. To improve the surface area and stability of the Ag NPs, one effective method is to load them onto a porous material template. Because of its distinct form and chemical inertness, silica is a good material for templates. Unwanted agglomeration from external stimuli can also be prevented because metal NPs are known to adhere to silica well.



Keywords: Superhydrophobicity, Self-cleaning, Antibacterial, Smart coating.

Nickel Selenide as An Electrode Material for Supercapacitor Application

Samah M. Bekhit [a, *], Saad G. Mohamed [b], Ibrahim Ghayad [a], Moataz G. Fayed [b], W. Metwally [a], R. Abdel-Karim [c], and S. M. El-Raghy [c]

[a]Metal Technology Institute, Central Metallurgical Research and Development Institute (CMRDI), P.O.Box 87, Helwan, Cairo, Egypt

[b]Mining and Metallurgical Engineering Department, Tabbin Institute for Metallurgical Studies (TIMS), Tabbin, Helwan 109, Cairo 11421, Egypt.

[c] Department of Metallurgy, Faculty of Engineering, Cairo University, Giza 12613, Egypt

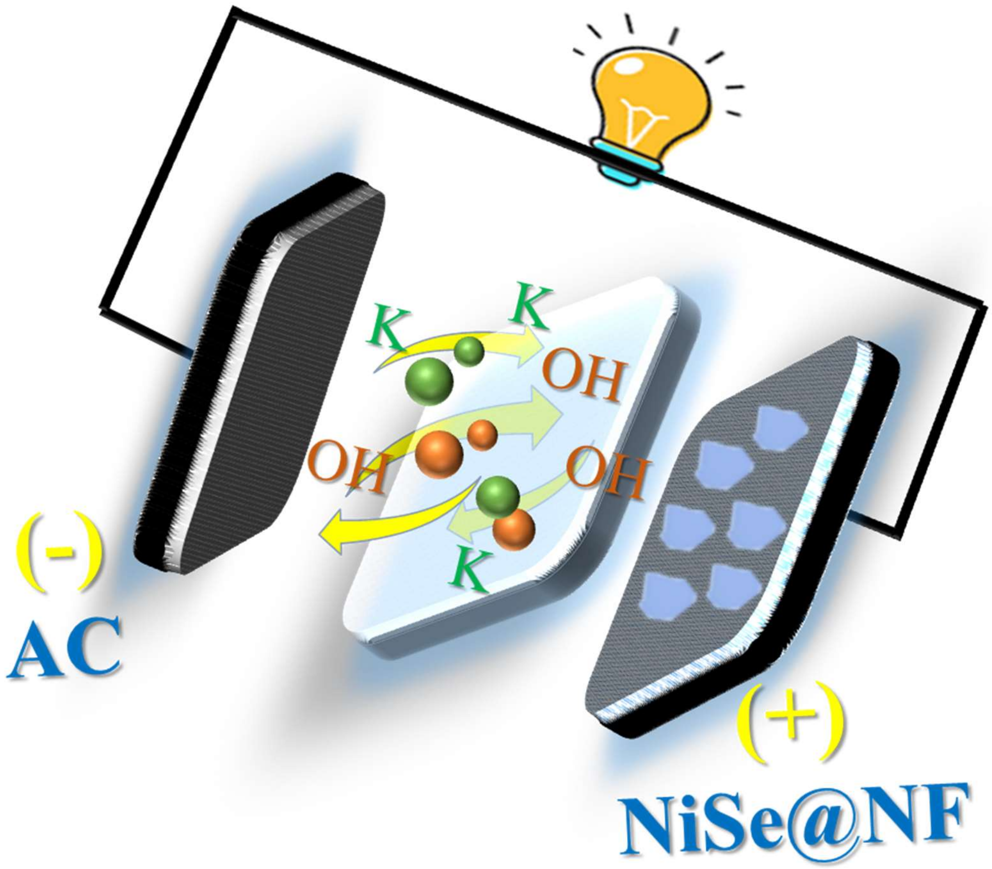
** Corresponding authors: Samah M. Bekhit (samah-mamdouh@hotmail.com)*

Abstract:

The growing need for renewable energy and environmental concern has prompted extensive study into energy storage devices especially batteries and supercapacitors and their electrode materials. In this work, nanorod arrays and snow crystal-like structures of nickel selenide grown on nickel foam were synthesized via one-step binder-free hydrothermal/solvothermal methods. The change in morphology and electrochemical performance were studied as a result of altering reaction time. The nanorod/snow crystal-like growth mechanism and its electrochemical behavior were investigated. The optimum reaction time was 18 h giving nanorod arrays of Ni_xSe_y with unique electrochemical performance when inspected as an active electrode material for supercapacitor (SC). It delivered a capacity of 426.5 C g^{-1} at 1 A g^{-1} in a three-electrode apparatus. The hybrid supercapacitor demonstrates 24.67 Wh kg^{-1} specific energy at 1020.83 W kg^{-1} specific power. Concerning snow crystal-like structure, experimental results demonstrated that the optimum reaction time was 24 h giving a unique morphology and excellent electrochemical energy-storage behavior. The snow crystal-like NiSe exhibited a high specific capacity of 763.5 C g^{-1} at 1.5 A g^{-1}. More importantly, a hybrid asymmetric supercapacitor was assembled with a binder-free snow crystal-like nickel selenide as a positive electrode and activated carbon as a negative electrode. It showed remarkable energy-storage characteristics, with a specific energy of 32.04 Wh kg^{-1} at a specific power of 1112.44 W kg^{-1}. Such excellent electrochemical performance proves that nickel selenide is a promising candidate electrode material for energy storage applications.

Keywords: Nanorod arrays; Hydrothermal reaction; Solvothermal reaction; Snow crystal; Hybrid Supercapacitor; Energy storage.

Graphical Abstract



Fourth Session

Chairman

Prof. Dr. Saeed N Ghaly

Assoc. Prof. Mamoun Abdel Hamid

Metallurgical Industries and Green Energy Transformation and Our bet on Long Duration Thermal Energy Storage Systems

Muhammad El Demerdash

CEO – Engazaat inc

Email: mdemerdash@engazaat.com

Abstract:

Rapid global electrification around the world, fossil fuels are being replaced by electricity, for example, due to the increased use of electric cars and the fact that more and more people are connected to the grid. To ensure the sustainability of this transition and growth, the grid must utilize renewable sources of energy to an increasing extent. Greater insight into climate threats and declining prices, particularly for photovoltaics, is driving this green transition. When the element of production based on renewable sources increases in the energy mix, the need for energy storage grows simultaneously because these energy sources have intermittent production, which varies with the time of day or weather conditions. A solution that stores energy when production is high and demand is low, and that delivers this at an attractive cost and without emissions when production diminishes and demand stands firm, Access to reliable and renewable energy at the right price is decisive in achieving sustainable global growth and is one of the UN's Sustainable Development Goals for 2030. In many parts of the world, solar and wind energy are in abundance, but they have no way of accessing a reliable power grid. Today, nearly a billion people live in off-grid areas, and double that number live in areas with unstable grids. This is inhibiting global growth and is obstructing exposed areas from finding a way out of poverty and creating welfare. The sustainable energy that can be generated here has to be stored and made available at a competitive cost when it is needed. At Enagzaat we have made our bet for green energy transition on Thermal Energy Storage Power on Demand, and stores energy as 600-degree Celsius heat in recycled aluminum. Using a Stirling engine, the energy is converted in a controlled manner to electricity and into heat at 55-65 degrees Celsius. The system can achieve a total efficiency of up to 90 percent from stored energy to output electricity and heat. The solution is modular and cost-effective from 0.1 MW to 100 MW, and is capable of supplying, for example, factories, mines, farms, and small communities with renewable energy at a low cost 24 hours a day.

Keywords: Green Energy Transformation, Metallurgical Industries, Thermal Energy Storage Systems

Pipelines External Corrosion Direct Assessment- Case Studies and Lessons Learnt

Islam Saleh

Cathodic Protection Department Head- ICE & Houssam Sabry, Managing Director ICE

Email: iceni6@yahoo.com

Abstract:

Pipelines Integrity Management System (PIMS) is essential to ensure the safe operations of the pipelines. External Corrosion Direct Assessment is an essential element within PIMS. NACE has illustrated the basic elements of ECDA in its Standard Practice 502. Since 2003, ICE has done numerous ECDA with emphasis on Close Interval Potential Survey (CIPS) and Direct Current Voltage Gradient (DCVG). ICE has covered more than 3000 Km in total of ECDA surveys. This presentation highlights the importance of ECDA in comparison to In Line Inspection (ILI) in addition to providing case histories and findings during ECDA exercises during the past 20 years.

Development of Mixed Metal Oxides (MMO) Electrodes with High Electrocatalytic Activity for Electrolysis Applications

Ibrahim M Ghayad

Dean of the Metals Technology Institute, CMRDI

Email: ighayad@cmrdi.sci.eg

Abstract:

Mixed metal oxide (MMO) electrodes are devices with high electrocatalytic activity and corrosion resistance for use in electrolysis. They are made by coating a substrate, such as pure titanium plate or mesh, with certain types of metal oxides. MMO is usually RuO_2, IrO_2, or TaO_2, which possess high electrocatalytic activity towards the desired reactions such as the production of chlorine gas. MMO also contains titanium dioxide which prevents corrosion of the substrate. The loading of MMO coating on the substrate can be in the order of around 2-5 grams per square meter.

MMO electrodes find wide applications in the Chlor-alkali industry, as anodes for cathodic protection of buried or submerged structures, in the electrowinning of metals, electrolysis of water for producing hydrogen and oxygen, and in wastewater treatment.

The present work aims to develop relatively cheap MMO electrodes with high electrocatalytic for electrolysis applications especially Chlor-alkali and cathodic protection applications. An appropriate concentration of precursors ($RuCl_3$, $TiCl_3$, $IrCl_4$, $TaCl_5$, etc.) solution is prepared in distilled water or isopropanol and painted with a brush or sprayed onto the titanium substrate to give MMO coating with varying combinations of the required oxides. The coated material is heat treated to eliminate all organic materials and form the oxide. This procedure is repeated many times to give the desired coating thickness.

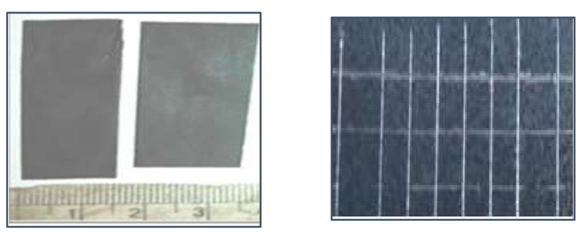


Fig. (1) Macro graph of RuO_2-IrO_2-TaO_2 coated Ti samples and its adhesion test

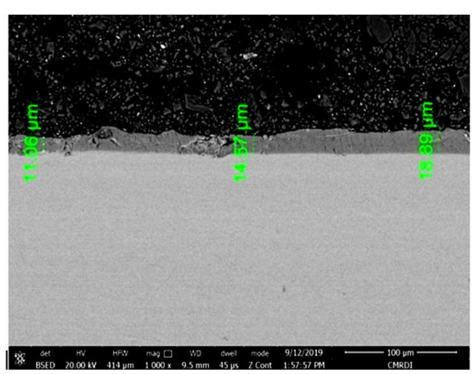


Fig. (2) SEM of the cross-section of Ti substrate coated with RuO_2-IrO_2- TiO_2

Manufacture of carbon nanotube (CNTs) from orange peel

F. Abdel Mouez [a], Heba.H.Ali [b]

a Researcher at Corrosion Control and Surface Protection department, Central Metallurgical Research & Development Institute CMRDI, Cairo, Egypt.
b Researcher at pyrometallurgy department, Central Metallurgical Research & Development Institute CMRDI, Cairo, Egypt.

Email:fatom.am@hotmail.com

Abstract:

The potential application of carbon nanotubes (CNTs) such as fuel cells, electronics, medical chemical exploratory devices, and many modern technologies increased so the demand for the production of carbon nanotubes with a cheap and simple method increased. Its purchase percentage in the global markets increased about 26% over last year. Therefore, there is an urgent need to produce CNTs, but unfortunately, Egypt is outside this global market share.
Herein, a novel and eco-friendly technique used for the production of carbon nanotube was investigated. Orange peel was used as a precursor for carbon nanotube. The final products were analyzed using TEM, XPS, and XRD. The XRD and XPS studies revealed the presence of a graphitized carbon nanotube. Furthermore, TEM analysis showed high quality, uniform diameter, and high length/diameter ratio. As well as, the wall structure of CNTs was similar to that of highly oriented pyrolytic graphite (HOPG).

Keyword: carbon nanotubes; TEM; XPS; and XRD

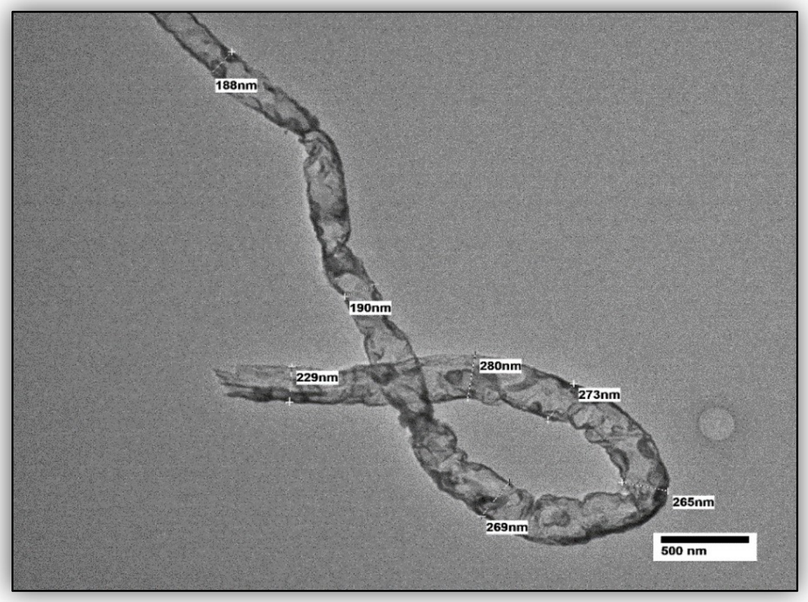


Fig. (1) high quality, uniform diameter, and high length/diameter ratio carbon nanotube

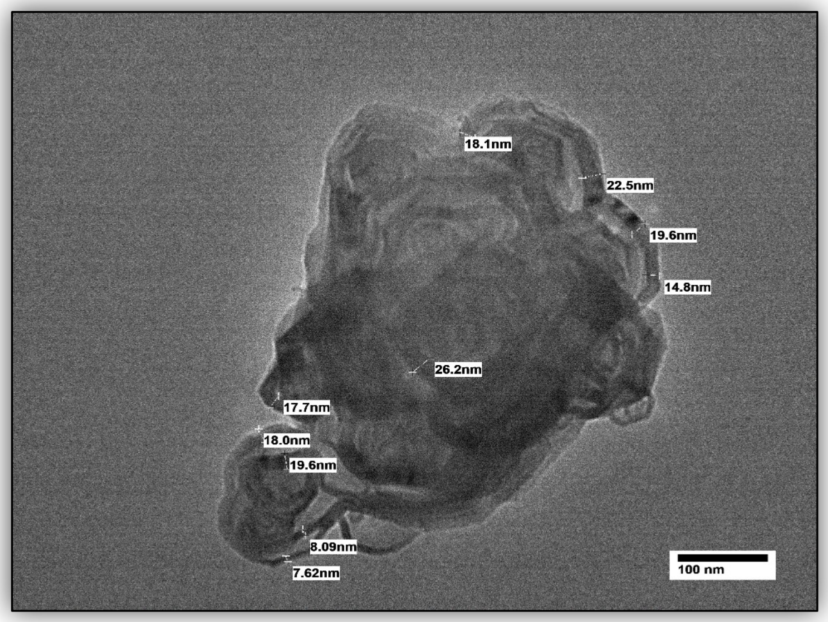


Fig. (2) The wall structure of CNTs similar to highly oriented pyrolytic graphite (HOPG)

An economic and innovative technology of steel production via direct alloying

Hassan Bahaa[1], A. Ahmed[1], M. F. Abadir[2], T. Mattar[1]

(1) Steel and Ferroalloys Technology Department, Central Metallurgical Research and Development Institute (CMRDI), Cairo, Egypt

(2) Chemical Engineering department at Faculty of Engineering - University of Cairo.

Email: hassanbahaa.cmrdi@gmail.com

Abstract:

The production efficiency in steelmaking may be increased by decreasing the consumption of expensive ferroalloys. In 2021, about 70% of the total Egyptian production of steel was rebars consuming about 140 thousand tons of ferromanganese 75 (FeMn 75). Direct alloying (DA) of the steel has potential benefits; it minimizes alloying cost, total energy consumption, and CO_2 emissions, compared with ferroalloys. On the other hand, ferroalloys production is considered a highly consuming power industry, what affects negativity on production economics and the environment through pollutant emissions.

The development of the alloying and modification of steel by oxides, including natural materials is very promising. Potential materials utilized for this purpose are lump ores, ore fines, special slags, self-reducing briquettes, and others. This trending technique (direct alloying) has been tested for steel production in converters, induction furnaces, and electric arc furnaces. Nowadays in Japan, about 50% of the manganese used in steel alloying is direct alloying technique.

The replacement of using Fe-Mn 75 in the production of steel rebar grade B500DWR by adding manganese oxide to directly alloy the steel grade B500DWR has a great interest through the economic benefit of not employing expensive manganese ferroalloys, saving power and resources, and controlling the air pollutants. This work aims to introduce an economic and innovative technology of steel production via manganese direct alloying replacing the traditional one.

Keywords: Ferromanganese production, direct alloying, steel production, briquetting, steel rebars, manganese oxides.

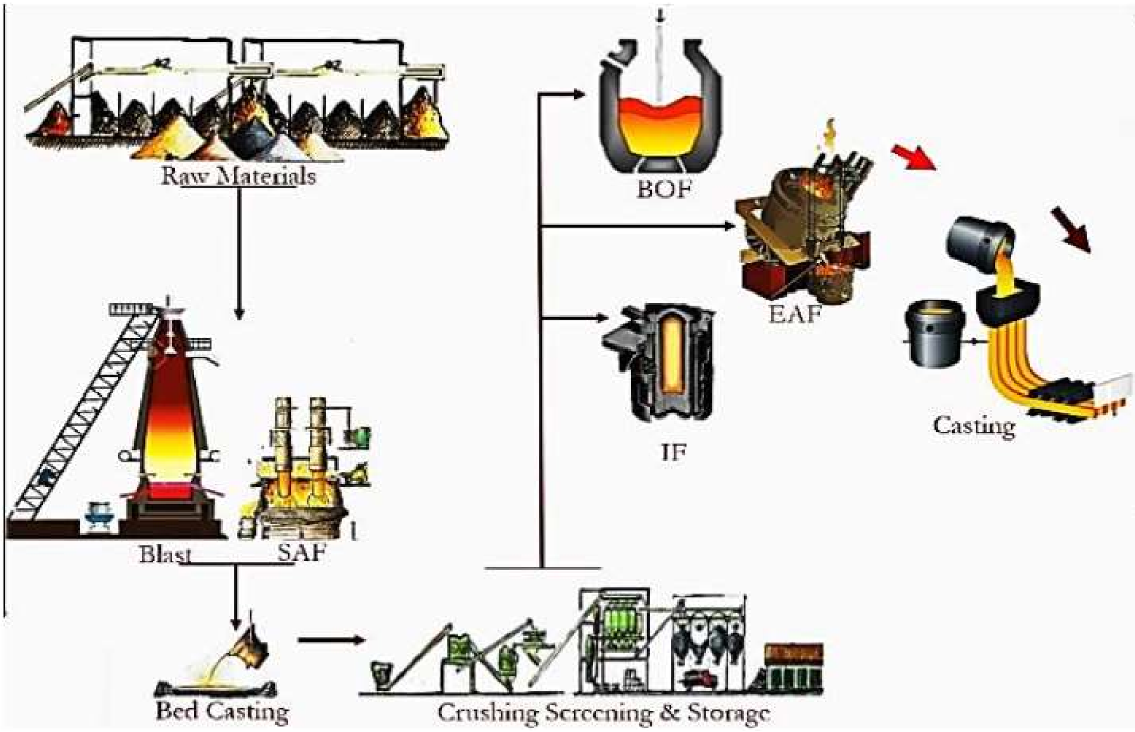


Fig. (1) Traditional process of steel alloying including ferromanganese production

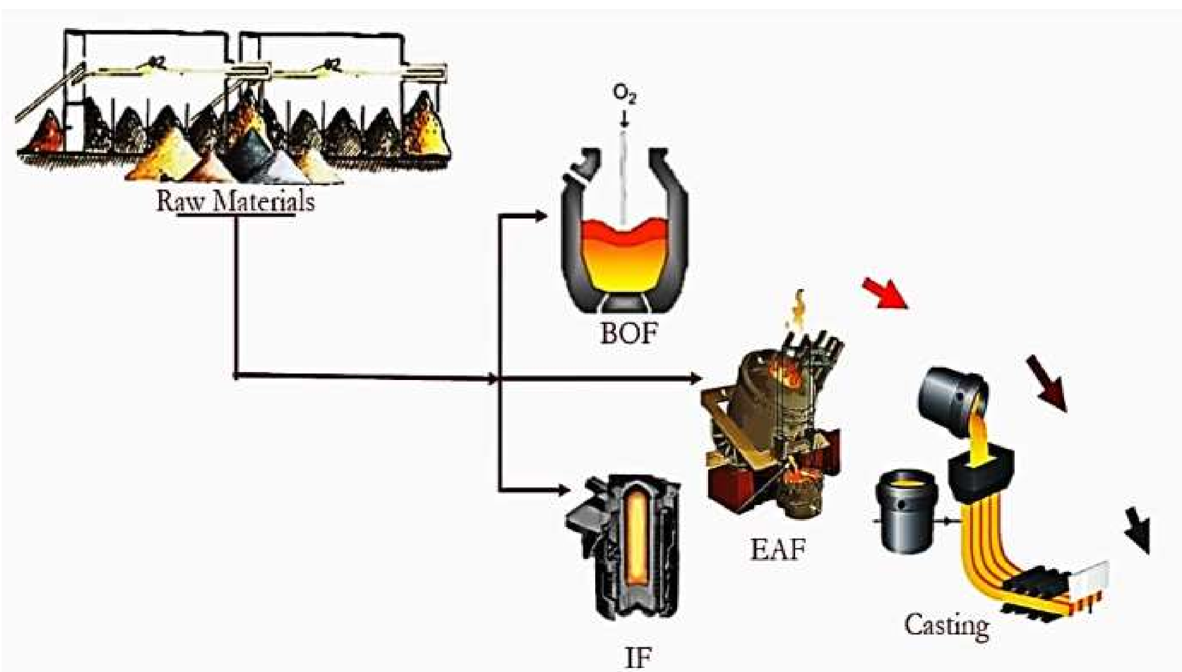


Fig. (2) Innovative process of steel alloying including direct alloying technique

Recycling Of Steelmaking Mill Scale Waste to Produce Low Alloy Carbon Steels

Mamdouh Eissa
Steel and Ferroalloys Department, Central Metallurgical R&D Institute
Email: mamdouh.eissa@gmail.com

Abstract:

In Egypt, crude steel production has increased significantly with a higher growth rate in the past years of the 21st century. Furthermore, many mill steel companies have been established for steel processing. With the increase in steel production and steel processing, large amounts of waste materials (slag, dust, and mill scale) are produced.

Mill scale is one of these waste materials produced during preheating of steel slabs and billets before hot rolling in all iron and steel companies, **Figure 1**, and its specific production is about 20-40 kg/ ton of hot rolled product. The mill scale generated from the hot rolled steel products in Egyptian integrated and processing steel companies has amounted to 200000 tons annually. This bi-product mill scale is mainly iron oxides and is considered a rich iron source (about 70% Fe). On the other hand, there is a shortage in steel scrap supply for Egyptian steelmaking companies. Furthermore, the higher rolling facilities in many Egyptian mill necessitate importing of steel billets from abroad.

The research team of the Steel and Ferroalloys Department, CMRDI has succeeded through one track of an alliance project funded by the Academy of Scientific Research in using these wastes for the production of high purity pig iron at the pilot plant level at CMRDI and on the industrial level at the Egyptian Company for Ferroalloys, Edfo, **Figure 2 (A)**. The produced high-purity pig iron has been successfully used as an alternative to imported sorel in the production of many ductile cast iron products on the industrial level at El-Nasr Castings Company, **Figure 2 (B)**.

The proposed project aims to adapt a suitable technology for recycling steelmaking mill scale waste by adjusting the smelting process to produce low alloy carbon steels on a semi-industrial scale.

Different heats of the smelting process will be carried out at a pilot plant submerged arc furnace using different reductants and different fluxing materials to adapt an economic smelting process for producing low alloy carbon steels and attain the highest iron recovery and output. The produced steel ingots will be hot rolled or hot forged to produce steel bars. The produced steel bars will be subjected to microstructure observations, hardness measurements, and tensile testing. At the end of the project, it is designed to produce 500 kg of low alloy carbon steels using the mill scale as the charging material as an indication of easeful of the adapted production technique. The different parameters of the adapted technology will be specified to be ready for implementation on an industrial scale for the production of low alloy carbon steels from mill-scale waste.

Four steelmaking companies support the project: Delta Steel Mill Company, Al Ezz Flat Steel Company, Ezz Steel Company, and El-Marakby for Metallic Industries, as they have huge amounts of mill scale and consider this project is very important to increase the added value of this by-product.

Keywords: Mill scale, steel, smelting, microstructure, mechanical properties.

Fig. (1) Accumulated mill scale in steel companies

A: High purity pig iron produced from mill scale on pilot plant level at CMRDI and the industrial level at the Egyptian Company for Ferroalloys.

B: Ductile cast iron products, produced on the industrial level at El-Nasr Castings Company using the high purity pig iron produced from mill scale.

Influence of Fluxing Materials, Chromite, Mill Scale on Reduction of Mixture of High Iron Low Manganese Ore and High Manganese Low Iron Ore by Alumino-Thermic Process

Prof. Dr. Saeed Ghali

Steel Technology Department, Metal Technology Institute, Central Metallurgical Research & Development Institute (CMRDI) – Cairo – Egypt

A3708052@gmail.com

Abstract:

A mixture of 250 gm high manganese low iron ore and 250 gm high iron low manganese ore was reduced using aluminum powder as a reducing agent. The amount of reducing agent was investigated Preheating for iron and manganese ores was carried out before investigation of fluxing materials and additives. Lime addition as fluxing was investigated for up to about 10% of a mixture of iron and manganese ores weight. Fluorspar addition was investigated for up to about 6% of a mixture of iron and manganese ores. The effect of mill scale and chromite additions on metallic yield and recoveries of alloying elements was investigated. It was found that the sintering of iron and manganese ores improves the reduction process. The addition of a reducing agent (aluminum) was greater than the 1.2 stoichiometric ratios to improve the reduction process. The optimum conditions of additives were found that 7.75% and 5 % of lime and fluorspar respectively. The influence of mill scale and chromite on metallic yield and recoveries of alloying elements were investigated.

Keywords: Alumino-thermic, Iron ore, manganese ore, low grade, high manganese, high iron, fluxes, chromite, mill scale.