

# Met-Info



**IIM**  
Metallurgy  
Materials Engineering



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An Inhouse Publication

## The Indian Institute of Metals Delhi Chapter

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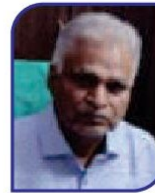
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## Dr Sanak Mishra felicitated by the Hon'ble Minister of Heavy Industries & Steel

Ministry of Steel had constituted 14 Task Forces to address various issues related to decarbonization in Indian steel industry. Dr Sanak Mishra, Former President IIM, and ex MD, Rourkela Steel Plant, and Member of Board of Directors, SAIL, chaired one of these Task Forces, *Use of Biochar as a Reductant in the Primary Stage of Ironmaking*. Based on the reports submitted by the 14 Task Forces, the Ministry of Steel prepared a consolidated and comprehensive position report titled **"Greening the Steel Sector in India: Road Map & Action Plan"**.

The document was released by the Hon'ble Minister of Heavy Industries & Steel, Shri HD Kumaraswamy in an event organized by the Steel Ministry on September 10, 2024 at the India International Centre, New Delhi.

On this occasion the Chairmen of the 14 Task Forces, including Dr Sanak Mishra, were felicitated by the Hon'ble Minister.





*Hon'ble Minister of Heavy Industries & Steel Shri H D Kumaraswamy felicitating Dr. Sanak Mishra*

## **Zinc Consumption in India**

- Demand for primary and refined zinc in India is currently close to 800-1000 tonnes per annum.
- Per capita consumption of zinc in India is around 0.5 kg. Global average is around four kg per capita. In developed countries like US, Europe, Korea, it can go up to 6-7.
- The world is switching over to green energy and strong growth is likely in solar photovoltaics (PV). Energy Transition gives some wonderful opportunities for use of zinc. PV and wind energy requires a lot of zinc to protect the steel supports.
- Zinc is also used to protect the towers for wind energy, especially those towers that are positioned at sea shore.
- The demand of zinc is expected to double in India in the next five to ten years on the back of huge investments in infrastructure sector, including steel.

- The demand for zinc in India depends largely on the growth of the steel market as zinc is mainly used to galvanise steel to protect it from corrosion. There are lot of plans for new galvanizing lines in the country.

*Source: The Pioneer, New Delhi, 24 May 2024*

### **Zinc Demand in India Likely to Double in next 5-10 years**

The demand of zinc is expected to double in India in the next five to 10 years on the back of huge investments infrastructure sector, including steel, as per International Zinc Association. The demand for zinc in India depends largely on the growth of the steel market as zinc is mainly used to galvanize steel to protect it from corrosion. The market for primary and refined zinc in India is currently close to 800 to 1,000 tonnes per annum, and has a great opportunity to increase with all the developments going in India.

There is a huge investment likely in additional steel capacity and steel still needs to be protected by galvanized coatings. There are a lot of plans and investments going on for new galvanizing lines.

With the world switching over to green energy and strong growth in solar photovoltaics (PV), there seems a great opportunity for zinc in 2024. Investments in solar PV and wind energy and especially those two require a lot of zinc to protect steel supports. Zinc is also used to protect the towers, the wind towers for wind energy, especially those towers that are positioned at sea.

*Source: The Economic Times, 19<sup>th</sup> May, 2024*

### **ArcelorMittal's XCarb® India Accelerator Programme for Breakthrough Climate Tech Start-ups Announces Winners**

ArcelorMittal announced it has selected three start-ups as the joint winners of its inaugural XCarb® India Accelerator Programme.

The programme attracted over 50 applications and following an extensive review process by ArcelorMittal's XCarb® Innovation Fund and research and development teams, UrjanovaC, Agro Morph Technosolutions and Susstains Engineering Solutions have been selected as the winners. Each will receive prize money of

\$50,000 and mentoring aimed at developing their technologies and business models.

UrjanovaC is developing a CCUS (Carbon Capture, Utilization, and Storage) technology that aims to support the decarbonization of hard-to-abate sectors including steel. The technology uses a patented catalyst and wastewater to convert industrial CO<sub>2</sub> emissions from flue gases into useable by-products such as PCC (calcium carbonate) and soda ash (sodium carbonate) that could find use-cases in multiple industries.

Agro Morph Technosolutions is creating a modular, algae-based CCUS system designed to remove carbon from industrial flue gases and absorb nutrients from wastewater. The process offers a clean method of carbon capture through natural photosynthesis instead of using chemicals and offers a broad spectrum of nutrient-rich algae-based products.

Sustains Engineering Solutions, founded by IIT Madras PhD students, is developing technology that aims to offer biochar to the steel industry as a replacement for coal. The biochar production technology is based upon biomass carbonisation, with innovative methods in place to increase the yield, productivity and quality of the biochar produced.

ArcelorMittal launched the XCarb<sup>®</sup> India Accelerator programme in July 2023, in collaboration with IIT Madras's GDC – Centre of Innovation & Entrepreneurship, and supported by ArcelorMittal's joint venture in India, ArcelorMittal Nippon Steel India (AM/NS India).

The programme was designed to support ArcelorMittal's climate ambitions and India's extensive community of start-ups developing technologies that hold the potential to support the global climate transition.

Winners of the XCarb<sup>®</sup> Accelerator programme in India presented novel ideas that hold significant industrial decarbonisation potential. AM/NS intend to support these innovative young companies as they look to develop and scale their technologies.

UrjanovaC's groundbreaking CO<sub>2</sub> management technology aims to tackle one of the grand challenges of this century. This sustainable, practical, low-cost, and scalable decarbonisation technology based on a patented catalytic process captures CO<sub>2</sub> from air as well as emission gases and stores it permanently as



carbonate salts. The team at UrjanovaC envisions translating net-zero pledges into reality through rapid deployment and is thrilled about the upcoming partnerships across borders and sectors.

“ArcelorMittal’s XCarb® Accelerator Programme was a great opportunity for AgroMorph and helped it explore decarbonization challenges via algae. The program provided in-depth understanding and perspectives of the steel industry, which is a great value-add for start-ups.

Susstains envision to create a sustainable ecosystem around biomass to biochar business with our novel technology. The XCarb® Accelerator programme was a great opportunity, as it helped in understanding the potential use of biochar in the steel industry. Moreover, testing biochar samples at the AM/NS India facility gave Susstains the confidence that, with some fine-tuning, our biochar could potentially replace coal.

*Source: ArcelorMittal News, 16 July 2024*

## Type and Sizes of Papers

### **EDITOR'S NOTE**

*We use papers every day in our homes or office or in industry. Do we know there are a lot many variety of paper being made and used? It is interesting to know all categories of papers as given in this exhaustive article. Also included is the sizes of various standard papers commonly used.*

Paper, an integral part of human civilization, evolved over many centuries and has served a variety of purposes beyond mere writing. The world of paper encompasses a vast array of types that are tailored to satisfy specific needs and applications.

Traditionally, paper is a material composed of cellulose fibers derived from wood, rags, grasses, or other sources, processed into thin sheets. These sheets are then utilized for writing, printing, drawing, packaging, and a multitude of other applications. Generally, paper can also be defined as any thin, flexible material that can be written on, printed on, or used for packaging.

### **Types of Paper**

## **1. Wallpaper**

Wallpaper is a decorative type of paper used to enhance the visual appeal of interior walls. It has customizable nature and extensive range of designs, making it suitable for different environments and styles. Its installation is labour intensive, and its removal may damage the wall.

## **2. Graph Paper**

This has a grid of horizontal and vertical lines, used to plot mathematical functions, drawing diagrams, commonly used in educational, or engineering environments.

## **3. Parchment Paper**

A type treated with sulfuric acid or zinc chloride to give it a smooth, nonstick surface. frequently employed in cooking.

## **4. Wrapping Paper**

Wrapping paper is an ornamental type of paper used to cover gifts for special occasions such as birthdays or holidays. It is lightweight with myriad of designs.

## **5. Cardstock**

Cardstock, a thick and durable type paper, is known for its heavy weight. used for greeting cards, invitations, postcards, playing cards, business cards etc.

## **6. Butcher Paper**

Butcher paper is used to wrap meats, fish, and more. Its thickness, durability, and waterproof coating make it useful for wrapping meats.

## **7. Tissue Paper**

Characterized by thinness, softness, light weight, and ornamental potential, often used to wrap and protect gifts and fragile objects. Another use is facial tissue or toilet paper. Has light weight and ability to form to irregular surfaces, it can be easily torn.

### **8. Construction Paper**

A popular paper used for arts and crafts, in a variety of colours. Has rough texture which makes it less ideal for printing. Has brittleness compared to other type paper.

### **9. Water color Paper**

Commonly used in art and comes in hot-pressed and cold-pressed varieties. Hot-pressed has a smooth surface. It absorbs water well so good for painting. painting.

### **10. Wax Paper**

Has layers of tissue paper coated with food-grade paraffin wax. This makes it useful for nonstick cooking applications and moisture resistance.

### **11. Crepe Paper**

An ornamental paper used in crafts and gift wrapping- similar to tissue paper in that it is thin and comes in a variety of colours and textures. Commonly used for decorating parties or special occasions or for wrapping gifts.

### **12. Vellum Paper**

A translucent paper, used by scrapbook makers and card artists for its appearance, elegant texture, capacity for creative endeavours. tendency to smudge/ crease easily.

### **13. Copy Paper**

Good for document copying and printing and is typically available in standard legal and letter sizes. Used from printing official documents to sketching

### **14. Sandpaper**

Sandpaper is a heavy-duty paper with abrasive bonded to it and is characterized by its diverse range of grit sizes. It is commonly utilized to alter the surface textures of wood, plastic, drywall, metal, and other materials by removing, smoothing, or roughing surfaces. The grit size numbering system assigns low numbers to more coarse abrasives, while high numbers denote finer abrasive textures.

### **15. Litmus Paper**

Impregnated with dyes extracted from lichens, litmus paper undergoes colour changes based on the pH level of any solution it contacts. .

### **16. Tracing Paper**

Thin and translucent, tracing paper serves as an ideal medium for replicating patterns for design. Drawing and artwork. Tracing paper allows a user to precisely copy designs and drawings in a variety of projects.

### **17. Photo Paper**

Photo paper has special design features to enable it to accurately reproduce images. Photo paper is thicker and heavier than copy paper and has specialty surface coatings composed of various polymers or resins that make it ideal for use in photography.

### **18. Printing Paper**

Printing paper is a versatile paper type encompassing a range of types tailored for various commercial purposes such as books, magazines, newspapers, office documents. Has varying weight or surface texture for different applications.

### **19. Blotting Paper**

A paper is a type of paper known for its absorbency and smudge prevention, it is porous and easily absorbs extra oil or ink.

### **20. Kraft Paper**

Made from wood pulp, is typically brown and known for its tear resistance, strength and versatility - popular choice for food packaging, envelopes, and paper bags.

### **21. Bristol Paper**

Typically refers to drawing paper composed of multiple layers of paper bonded under high pressure between felt rollers.

## **22. Linen Paper**

Linen paper is a type “fine stationery.” used for elegant certificates, wedding invitations, restaurant menus, resumes etc. Has aesthetic appeal and resemblance to linen fabric.

## **23. Manila Paper**

Crafted from partly bleached wood fibres, it finds extensive use in businesses as document storage folders and in art for many of same applications as paperboard.

## **24. Thermal Paper**

A unique type that changes colour as heat is applied due to heat-sensitive dyes . often used in point-of-sale terminals in retail shops instant printing without ink.

## **25. Foil Paper**

Lustrous type, that consists of mylar-coated paper sheets. The foil paper allows it to easily wrapped around objects, from cooking & food storage to packaging to crafts.

## **26. Newsprint**

Newsprint is a thin, weak, low-cost variant made from finely ground wood pulp, widely used in printing of newspapers, magazines, ad sheets, pamphlets etc.

## **27. Filter Paper**

Filter paper serves to separate contaminants from liquids or gasses.

## **28. Bond Paper**

A premium paper, finds wide use for letterheads, reports, and stationery. .

## **29. Chart Paper**

Commonly used in the medical or scientific fields. It is a lightweight, lustrous, and heat-sensitive paper. Medical diagnostic scans such as EKGs can be printed on.

## **30. Mulberry Paper**

Named after the bark of the tree it is fabricated from. Mulberry paper is often textured, has a distinct finish that features long fibres and irregular, yet attractive, edges.

### **31. Art Paper**

A general term used to describe many different art papers, including: drawing, painting, and printmaking. It is also available in acid-free options.

### **32. Canvas Paper**

Canvas paper resembles canvas fabric, often employed in painting and other mixed-media artwork. Compared to traditional canvas, it is lighter and thus easier to frame.

### **33. Rag Paper**

A high-quality paper type fabricated from cotton or linen fibres. It is often used for fine art and archival documents, has longevity and ability to maintain the integrity of documents and artwork over extended periods.

### **34. Archival Paper**

A type of rag paper, developed for assured preservation of quality paper documents over time by preventing degradation and discoloration. It is acid-free and manufactured entirely from cotton instead of wood pulp.

### **35. Photographic Paper**

Infused with chemicals sensitive to light to facilitate conversion of images into either a color or black-and-white printed image, comes in multiple finishes.

### **36. Book Paper**

Book paper is for use in books due to its balance of weight, texture, and ease of printing. From paperbacks and hardcover books to manuals and diaries. It is a versatile paper. It is affordable and widely available, prone to yellowing over time.

### **37. Coated Paper**

Coated with a gloss or matte layer, which helps to enhance print quality and paper durability. Additionally, it makes the paper more resistant to ink bleed

### **38. Greaseproof Paper**

Also known as butcher paper, is specially treated to resist grease and oil, popular choice for baking and food packaging. Has limited heat resistance. .

### **39. Honeycomb Paper**

Craft paper - lightweight yet strong nature and hexagonal cell structure which makes it suitable for packaging, insulation, and crafting purposes.

### **40. Wove Paper**

Commonly handmade by straining pulp with a wire mesh screen or woven fabric, has woven appearance when held against light due to the imprint of the screen used during its fabrication, still common today amongst hobbyists and in cultural traditions.

### **41. Typewriter Paper**

Lightweight paper used for manual typewriters- seldom used today due to personal computers.

### **42. Uncoated Paper**

Similar to copy paper or printer paper but does not have a matte or glossy top layer. Has a rougher surface. The capability to absorb more ink makes it more compatible with writing or printing compared to coated paper but also makes it more prone to smudging and having less vibrant printed images.

### **43. Greeting Card Paper**

A cardstock that is used for occasions such as: anniversaries, holidays, Birthdays. This paper is heavier and thicker than regular printer paper or copy paper. Can take creative designs, but lack flexibility.

### **44. Food Paper**

Encompasses other types such as wax paper, parchment paper, and butcher paper. Characteristics depend on specific application. there is a type to fit every need and every food. However, the single-use nature of these paper types can be wasteful.

#### **45. Tobacco Paper**

Thin paper specifically for the manual rolling of cigarettes, traditionally composed of wood pulp, but can also be fabricated from cellulose. Has slow-burning.

#### **46. Offset Paper**

Medium-weight paper that is wood-free and brighter than copy paper. It is frequently used in large-volume offset printing processes due to its smooth surface texture.

#### **47. Envelope Paper**

Used for enclosing and protecting documents or mail during transit or storage, has an opaque texture printed on its surface and often features an adhesive or clasp for closure. Envelope paper comes in different colors and sizes.

#### **48. Acid-Free Paper**

Acid-free paper is characterized by its neutral or alkaline pH level, which prevents yellowing and deterioration over time. It is appreciated for its ability to preserve documents, photographs, and artwork — making it a popular choice for archival applications, but has higher cost.

#### **49. Banknote Paper**

Banknote paper often used for printing currency. Composed of cotton and linen, banknote paper is known for its fibre distribution which adds aesthetic appeal to the paper, and watermarks to make currency counterfeit-proof.

#### **50. Laid Paper**

It is a paper similar to wove paper, created by using a screen. The screen uses leaves vertical and horizontal ribs on the laid paper due to inadequate absorption of pulp during the fabrication process. Like banknote paper, laid paper is used for



currency due to its counterfeit-proof characteristics, but also in ledgers and books.

### **51. Shoe Paper**

Shoe paper is a specially tailored paper used to protect shoes while in transit or storage. It is a thicker type of paper, has limited uses.

### **52. Post-Consumer Recycled Paper**

It is fabricated from previously used paper that is recycled back into the paper manufacturing process. Breaking the recycled paper back down to pulp requires processes to remove inks and adhesives and then mix it with newly created pulp. Post-consumer recycled paper products find many uses — from copy and printer paper to cardstock and more.

### **Paper Type Used for Embossing**

Embossing typically requires thicker paper types such as cardstock or Bristol paper, which can withstand the pressure required for embossing without tearing or warping. These papers provide a sturdy base for creating raised designs or patterns.

### **Paper Type Used for Laser Engraving**

Laser engraving requires paper that can withstand the intense heat generated by the laser without scorching or igniting. Therefore, coated papers such as cardstock, or specialty paper are used for this purpose.

### **Paper type Suitable for 3D Printing**

While conventional paper is not suitable for 3D printing due to its lack of structural integrity and flexibility, some specialty papers infused with polymers or other additives can be 3D printed which consists of bonding successive layers of coated paper together that are cut into the desired shape.

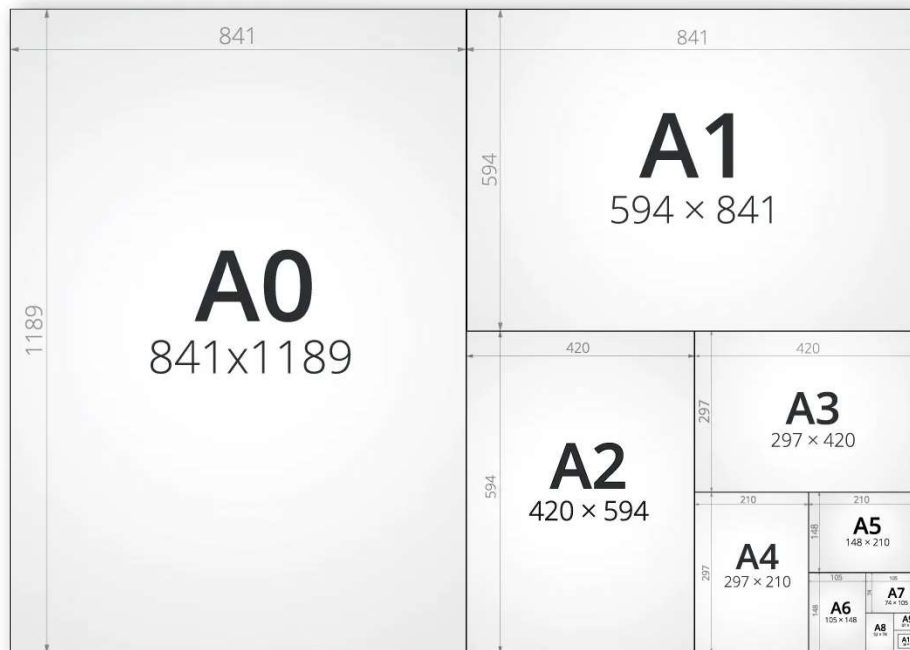
### **Considerations When Choosing a Paper Type**

Selecting the appropriate paper type depends on such factors as: its intended use, durability requirements, printing method, and budget constraints. Factors like weight, texture, finish, and composition play crucial roles in decision-making.

### What is GSM?

It indicates the heaviness of any paper in **Grams per Square Meter**.

### Standard Paper Sizes

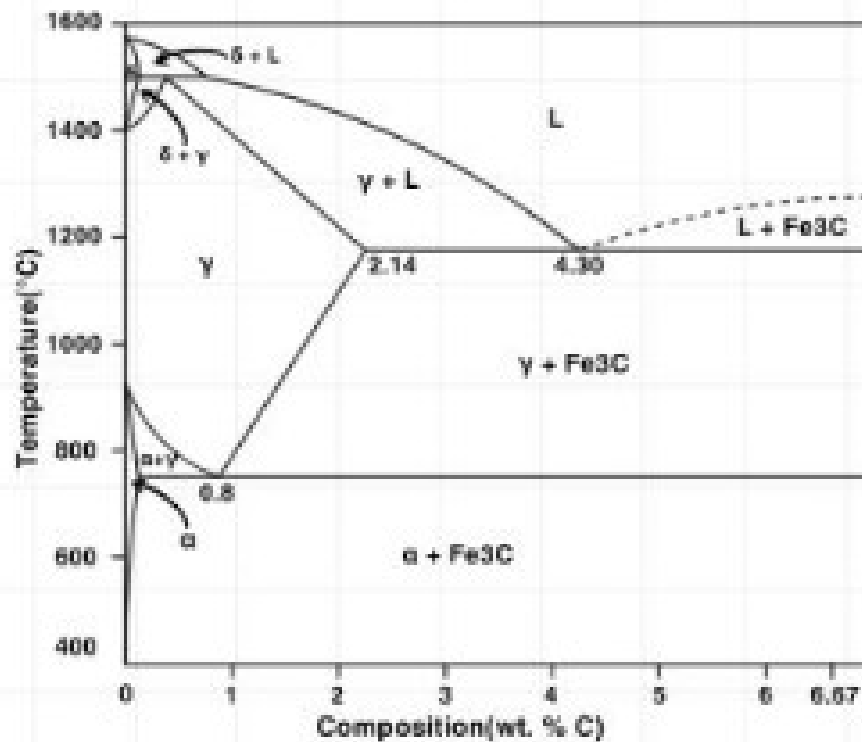


Source: Xometry, April 26, 2024

## Critical Metallurgy Diagrams

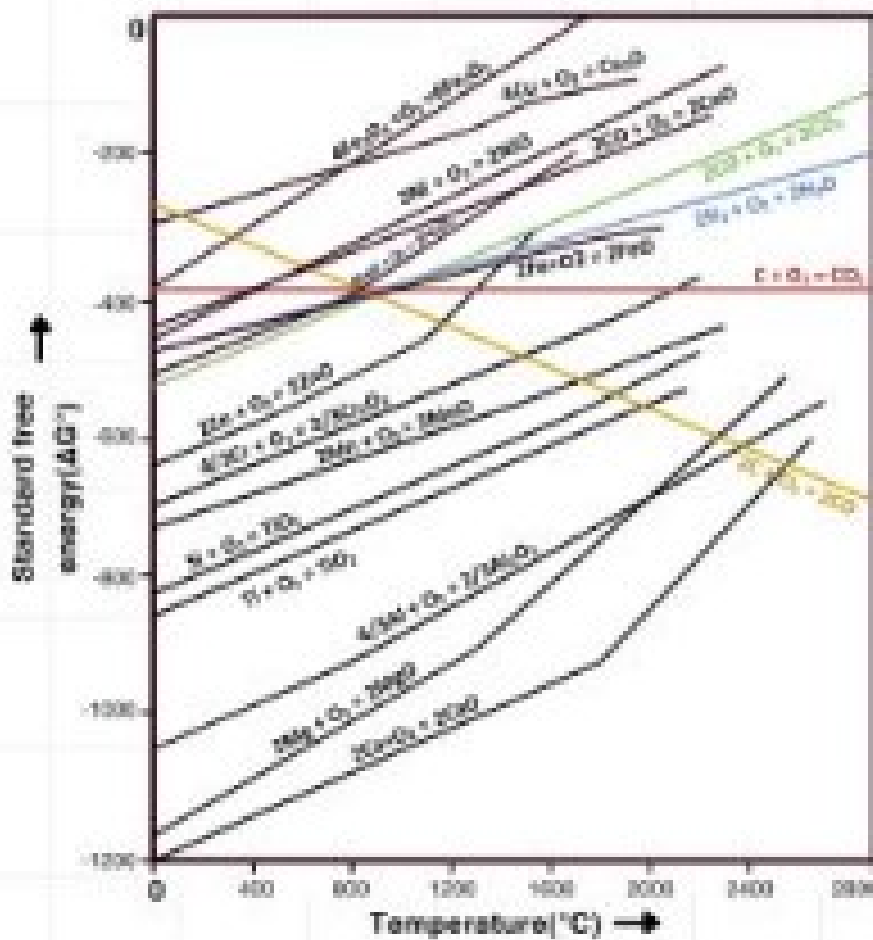
Metallurgical professionals must keep on refreshing these foundational diagrams.

### IRON-IRON CARBIDE DIAGRAM



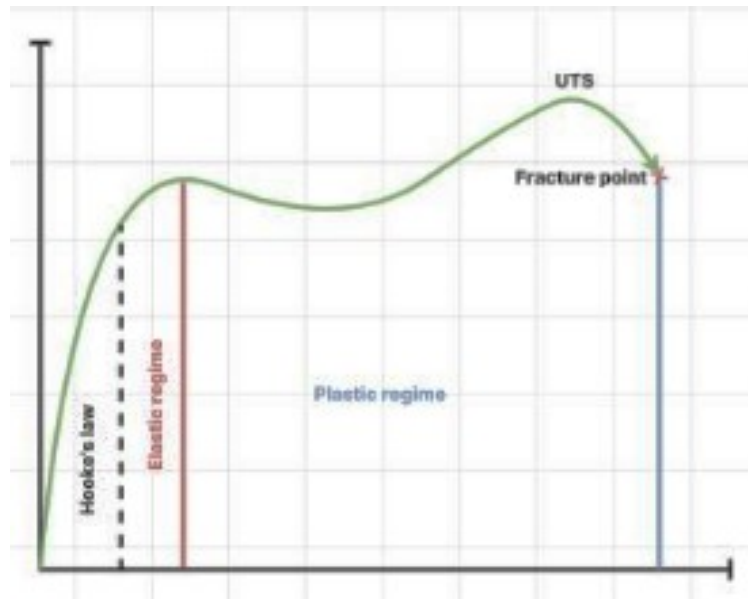
*For understanding steel and its microstructures*

# ELLINGHAM DIAGRAM



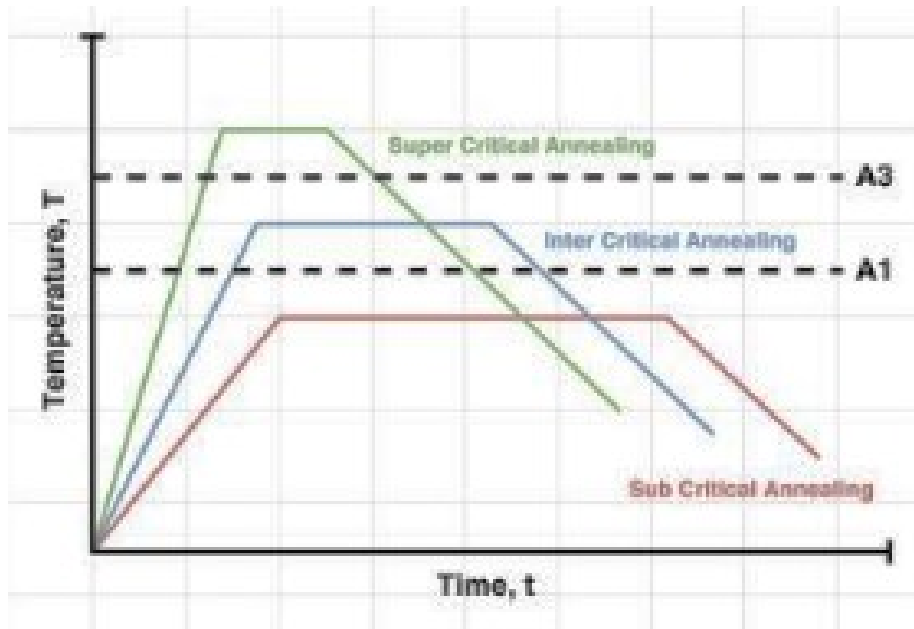
Crucial for grasping oxidation and reduction reactions

## ENGG. STRESS STRAIN DIAGRAM



*The blueprint of material behaviour under load*

## HEAT TREATMENT CURVE



*Key to unlocking the magic of metal properties*

## Know Your Members



### Shri R K Sinha

#### Educational Profile

B.E (Metallurgy), M. Tech (Ferrous Metallurgy), PGDBM

*Date of Birth : 18.02.1957*

#### Experience:

Started from Usha Martin in 1981 March from the Shop Floor Steel Making. That time most of the modernization was getting Entry in India through Usha Martin, Jamshedpur e.g \*complete shift in EAF Melting Practice by adopting Water Cooling Panel instead of Refractory, Bottom Tapping , Single Slag Process etc.

#### Achievements

- First Ladle Refining Practice, CaSi treatment concept, Leaded Steel concept, introducing Aluminum Killed Steel through Refining & not through the Wire Feeding in Casting Stream etc.
- First time in Sun Flag pioneered Continuously Sponge Iron Feeding through Roof Top which was earlier miserably failed by A Famous German OEM. Sun Flag after this prizing efforts even went to the tune of 100 % sponge usage when scrap was not available.
- Did a design change in Danieli's VD Unit in Modern Steel for deeper Vacuum treatment.
- Did successfully experimented - First time - dephosphorisation in Induction Furnace Melting.
- Equally exposed with same successful magnitude in all the three areas, viz. Shop Floor Working, Marketing and Green Field/ Brown Field Projects.
- My leadership was the Turn Around Factor in all the 4 companies that I worked. With all this eventful happenings, became the Director on Board within 20 years.

***After more than 4 decades in Steel Making and Management, now since January 2024, rendering consultancy services to steel industry.***

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