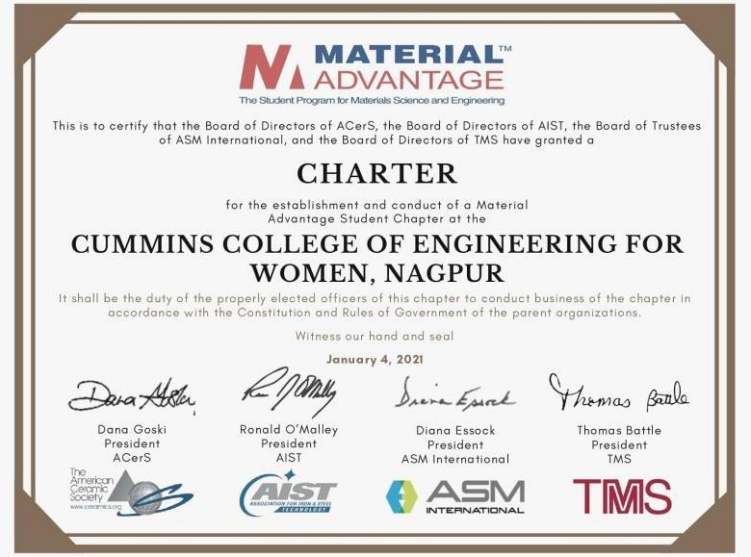
JULY 2021 | ISSUE 3

THE BEACON

CCOEW Nagpur Material Advantage Student Chapter Newsletter



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Message from Editors

Dear reader, Greetings to you!!
We are very excited and pleased to bring to you issue number three of our newsletter! Editing and Publishing "THE BEACON" Newsletter as a part of CCOEW Material Advantage Student Chapter gives us immense pleasure and a huge opportunity as an editor and co-editor.

BEACON is a person or thing that warns, guides or offers support, just like that we want to be our reader's "Beacon Of Knowledge". In pursuit of excellence, we do appreciate all those who have given their articles for this issue. We hereby want all the readers to enjoy reading our newsletter.

Radhika Naitam
Editor

Yukta Kuhike
Co-Editor

Message by Mr. Nitin Madhukar Datar

It's a moment of great honor for me to deliver a message for BEACON News Letter, which is a recent publication of Materials Advantage (MA) Chapter, Cummins College of Engineering for Women, Nagpur. Its not only a Outstanding work done by the entire team but also, it is 'need of an hour' for the current generation to get acquainted with material community which is a vital part of their education as well as upcoming profession.

Being the first ever Women's chapter in the world you are shouldering a great responsibility to explore the resources, understand your needs and make exposure responsibility to explore the to all your team for the best t

o best knowledge sharing and experience the essence of materials world and its activities. Publication of newsletter gives you a platform to bring forward key points on technology, Innovations, Future trends and also a chance to present best talent within you and your team to get massive exposure. I am sure, you all will enjoy and have a pride, when the responses start flooding as an encouragement.

You also need to promote new students at early stage and make them participate in MA Chapters activities, as developing a second level team is also part of your responsibility, be an example for others to spread materials knowledge cross the boundaries to all MA chapters and form your own identity.

Though this journey is a great challenge for each of you, I am sure with the help of tremendous support and encouragement from your college principal Mr. Bharatbhushan Joshi, your faculty advisors Mr. Yogesh Dandekar and specially your college management, I think sky is the only limit to have a clean leap. My All-Best Wishes.

Nitin Madhukar Datar
Executive Committee Member – ASM International Pune Chapter.
Senior General Manager – Carrao

Biodegradable Polymer Composites: Need of an Hour.

In an advance society like ours, everyone depends on composite materials for some or other aspects of our lives. Composite materials have a long history of usage. For example, straw was used by Israelites to strengthen mud bricks. Medieval swords and amors were made by using layers different materials. Composite materials are formed by combining two or more distinct materials that have different properties. The composite materials are being developed to replace conventional materials for competitive reasons such as high specific strength and stiffness, high fracture toughness, good resistance to heat, cold, moisture and ease of fabrication, extra. Composites are materials that comprise strong load carry material (known as reinforcement) embedded in weaker material (known as matrix). The matrix or binder (organic or inorganic) maintains the position and orientation of the reinforcement. Significantly, constituents of the composites retain their individual, physical and chemical properties; yet together they produce a combination of qualities which individual constituents would be incapable of producing alone.

Development of novel materials is required at this moment to suit the specific application, based on different criteria. Most of the researcher's works are moving towards development of lightweight materials and environmentally friendly materials, which will serve the purpose and also should not have impact on environment in terms of disposal, degradability, recycling etc. For developing biodegradable composites materials with environmental consciousness, composites materials based on poly lactic acid combined with natural fibers are gaining more importance, since environment friendly natural fibers are slowly replacing traditional fibers for newer material.

To develop environmentally friendly materials with the aim to replace the traditional synthetics such as nylon, polystyrene, polyvinyl chloride (PVC), polyethylene, polypropylene, etc., which come from oil sources, provoking environmental pollution and accumulation of many residues due to their extensive degradation time. Other advantage of the use of biodegradable polymers is the low cost of their production. Many polymers such as starch, polylactic acid, cellulose, chitosan, alginate, proteins, etc. have been focused with the purpose of making biodegradable and biocompatible materials, with reducing the impact on the environment caused by the production and use of petrochemical products. Among these bio polyesters, PLA is at present one of the most promising biopolymer.

Biodegradable polymers are capable of undergoing decomposition primarily through enzymatic action of microorganisms to carbon dioxide, methane, inorganic compounds, or biomass in a specified period of time. The biopolymers may be obtained from renewable resources and also can be synthesized from petroleum-based chemicals. Blending of two or more biopolymers can produce a new biopolymer designed for specific requirements. Biodegradability is not only a function of origin but also of its chemical structure and degrading environment. When a biodegradable material (neat polymer, blended product, or composites) is obtained completely from renewable resources, it may be termed as a green polymeric

Mr. Abhijit Sudamrao Getme (Assistant Professor, Mechanical Engineering Department, MKSSS's Cummins College of Engineering for Women, Nagpur)

Cummins College of Engineering for Women, Nagpur
MATERIAL ADVANTAGE
The Student Program for Materials Science and Engineering
CCOEW Nagpur
Material Advantage Student chapter

Carbon Fiber Reinforced Plastic

By: Shruti Dhole (2nd year mechanical student)

Carbon fibers were used in plastic for a long time. In 1879, Thomas Edison was experimenting with CF(Carbon Fiber) made from cotton threads and bamboo silvers. The first incandescent contained carbon fibers.

CF are industrially produced fibers which are refined in such a way that they consist almost exclusively of carbon. They are microscopically small and highly corrosion resistant.

Benefits of Adding Carbon Fiber to a Polymer

Tensile strength and flexural modulus increase with heat deflection temperature (HDT). Adding carbon fiber reinforcement reduces shrinkage and wrapping. Carbon fiber is long, thin strand made up of thousands of carbon filaments. One fiber is 5-10µm diameter and composed mostly of carbon. Crystals in carbon bond together and are aligned parallel to the axis of fiber. This makes fiber strong.

CFRP is Classified by Tensile Modulus

Carbon fibers are classified by tensile modulus. The tensile modulus ranges from 34.8 million psi. to 72.5-145.0 million psi. Steel is having a tensile modulus of 29 million psi thus the strongest carbon fiber is 5 times stronger than steel.

"Low" modulus fiber have tensile modulus below 34.8 million psi Fibers are also classified in ascending order as "Standard Modulus", "Intermediate modulus", "High Modulus" and "Ultrahigh Modulus". Carbon fiber with a classification of very high modulus have a tensile modulus of 72.5-145.0 million psi.

How is carbon fiber made?

Spinning: The PAN is spun using few spinning processes. Through this, the internal atomic structure of the fiber is formed. Fibers are then washed and stretched to the diameter needed. Stretching also helps align the molecules and form the carbon crystals made by carbonization.

Stabilizing: The fibers are chemically treated to change their linear bonding structure. The filaments are heated in the air so they pick up oxygen molecules and change their atomic bonding pattern.

Carbonizing: The fibers are then heated to high temperature heat without oxygen, so the fiber cannot burn. The atoms in the fiber vibrate very fast expelling most of the non-carbon atoms in precursor.

Surface Treatment: After carbonizing, the surface of the fibers do not bond well with the materials used in making composite materials. In this step, the surface of fiber is oxidized by immersion in various gases or liquids

Sizing: In this process, the fibers are coated to protect them from damage during winding or weaving.

Applications of CFRP

Carbon Fiber in Aerospace
Wind Turbine Blades
Super Structure of Ships

Resources:

www.researchgate.net

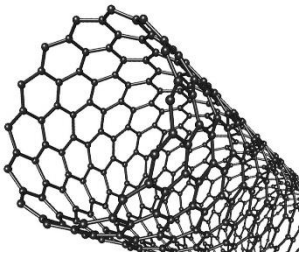
Fun-Facts

Mother of pearl, for instance, is an example of a naturally occurring **Metamaterial** that gives it its beautiful rainbow colour.

Amorphous metal or metallic glasses are basically are metal with a disordered atomic structure. They could be used by the military for the next generation of armour but are currently used for armour piercing ammunition. They also have applications in electrical grids, notably amorphous metal transformers.

The energy saved from **Recycling one plastic bottle** can power a 100watt light bulb for almost an hour.

Carbon Nanotubes can be incorporated into materials to makes them extremely strong but light weight. In the future we may be able to use them to build and elevator into space.



3D Printing will become more useful in creating composite materials in the future. They can be used to print layers of different materials making new types of composites.

Nanocomposites

By: Apoorva Sharma (3rd year mechanical student)

Nanocomposites are materials that incorporate nanosized particles into a matrix of standard materials. It is a multiphase solid material where one of the phases has one, two, or three dimensions of less then hundred nanometers(nm)or structure having nano-scale repeat distances between the different phases that make up the material.

They are highly influenced by structure, composition, interfacial interactions and components of individuals properties. Most commonly, nanocomposites are prepared by the process of in-situ growth and polymerization of biopolymers and inorganic matrix.

Polymer super-based nanocomposites

Polymer Nanocomposite are materials in which nanoscopic inorganic particles, typically of 10-100 A in at least 1 dimension, are dispersed an organic polymer matrix in order to dramatically improved the performance properties of the polymer. Systems in which the inorganic particles are the individual layer lamellar compound -most typically a smectite clay or nanocomposites of a polymer embedded among layers of silicates-exhibit dramatically altered physical properties relative to the pristine polymer.

Non-polymer-based Nanocomposites

1. metal-based nanocomposites

Characterized by

- Super plasticity
- Lower melting points
- Increased strength and Hardness
- Improved magnetic properties
- Increased electrical resistivity etc.

2. Ceramic based Nanocomposites

Characterized by:

- Better toughness
- increased ductility
- Increased strength and hardness

3.Ceramic-ceramic-based Nanocomposites

These can be used in the area of artificial joint implants for fracture failures and it could promptly reduce the cost of surgery and would extend the mobility of the patient. The lifespan would increased by 30 years, if the use of zirconia-toughened alumina nanocomposite implants effectively.

Advantages:

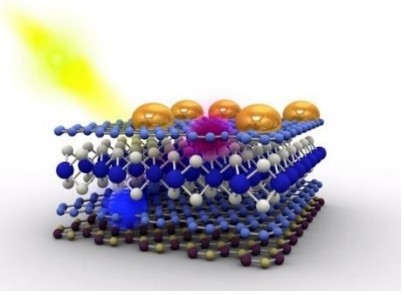
- Mechanical properties including strength, modulus and dimensional stability.
- Decreased gas, water and hydrocarbon permeability

Types of Nanocomposites:

- Ceramic Matrix Nanocomposites
- Metal Matrix Nanocomposites
- Polymer Matrix Nanocomposites

Applications:

- In thin film capacitors for computer chips.
- In solid Polymers electrolytes for batteries, etc



Resources:www.wikipedia.org
www.intechopen.com

Riddles

This has been known to cause a rush
But its not a Black Friday sale
It's a yellow precious metal
Weighed in troy ounces on a scale
It is…?

What material do you use
to make a clown outfit?

Did You Know?

Platinum, Palladium, Rhodium and their alloys are widely used catalysts such as vehicle exhausts. A rich Solution "washed" on to a ceramic substrate can leave A catalytic surface. The surface can also be a robust Construction of woven or knit wire that provides a large Surface for chemical production Platinum based catalyst have been used for nitric acid Production for more than 100 years.

Metal corrosion destroys 3-4% of the gross domestic product in developed countries each year.

Prince Rupert's drops are toughened glass beads created by dripping molten glass into cold water, which causes it to solidify into a tadpole-shaped droplet with a long, thin tail. These droplets are characterized internally by very high residual stresses, which give rise to counter-intuitive properties, such as the ability to withstand a blow from a hammer or a bullet on the bulbous end without breaking, while exhibiting explosive disintegration if the tail end is even slightly damaged. In nature, similar structures are produced under certain conditions in volcanic lava, and are known as Pele's tears.

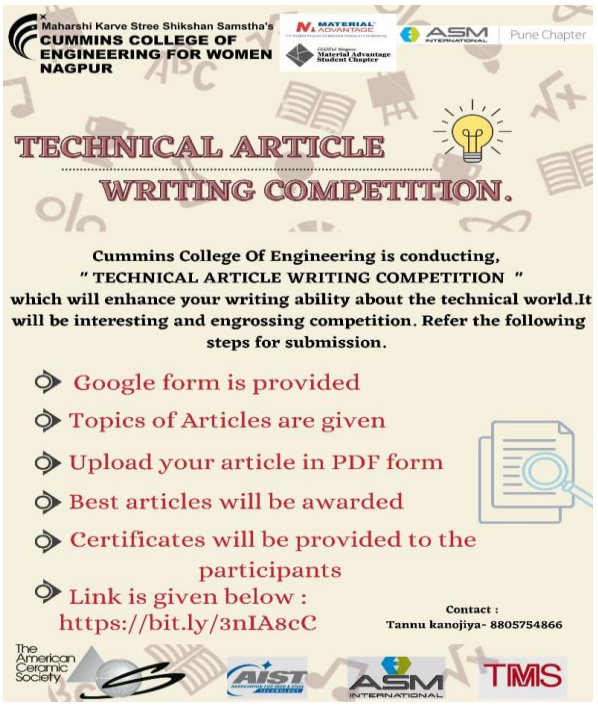
Water proof Socks :
Socks were invented in the 8th century BC by the ancient Greeks and were typically made from matted animal hair. Since socks were invented they have worked to absorb perspiration and keep feet warm in cold conditions. An invention of the 21st century, Waterproof Socks keep your feet warm and dry thanks to a waterproof breathable membrane that is protected by 2 knit sock layers.

Kinetic Sand looks like regular wet sand but is available in different colors. It is 98% ultra-fine grain sand mixed with 2% dimethicone (polydimethylsiloxane), and coated with olive oil. Because of its oil coating, the sand never dries out. It mimics the physical properties of wet sand.

Past Events

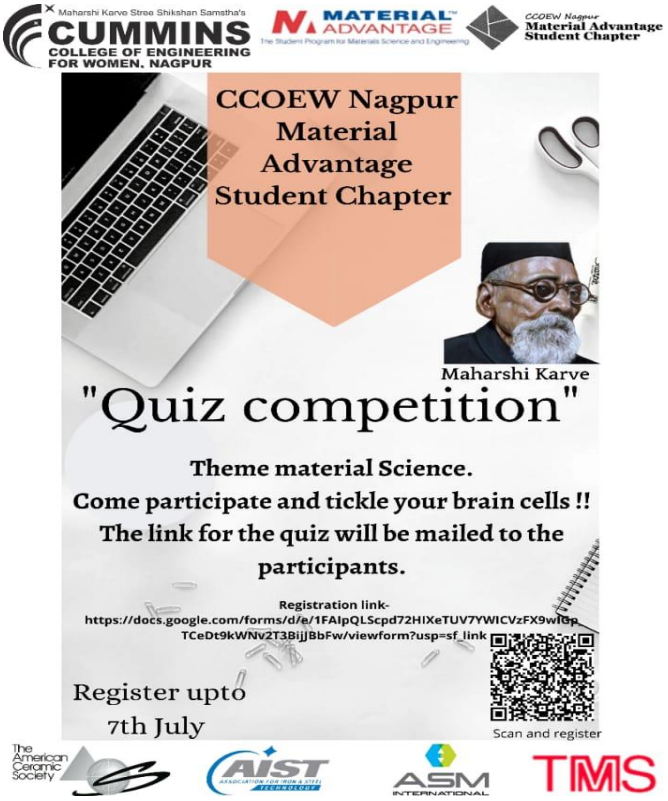
Technical Article Writing Competition:

On 23th May CCOEW Material Advantage Student Chapter conducted a technical article writing competition. In this, students were given options to give their articles either by word file format or hand written format. For this competition we got total thirty-four entries.



Quiz Competition:

CCOEW Material Advantage Student Chapter Organized a Quiz Competition. The quiz was based on Material science and material science-related technologies where this material science cruncher was a tough nut crack. Where firstly a google form was planned for the registration of the participants, we got an overwhelming response of a total of 488 registered participants on 25th June 2021. The quiz competition was planned for 15th July 2021, where it was a timed quiz with 25 questions, 20 minutes. Almost 21 colleges participated in this competition. Where 2 sets of the quiz were being made and where 55- 1st year, 101- 2nd year, 247- 3rd year, 84- 4th year.



Planed Events

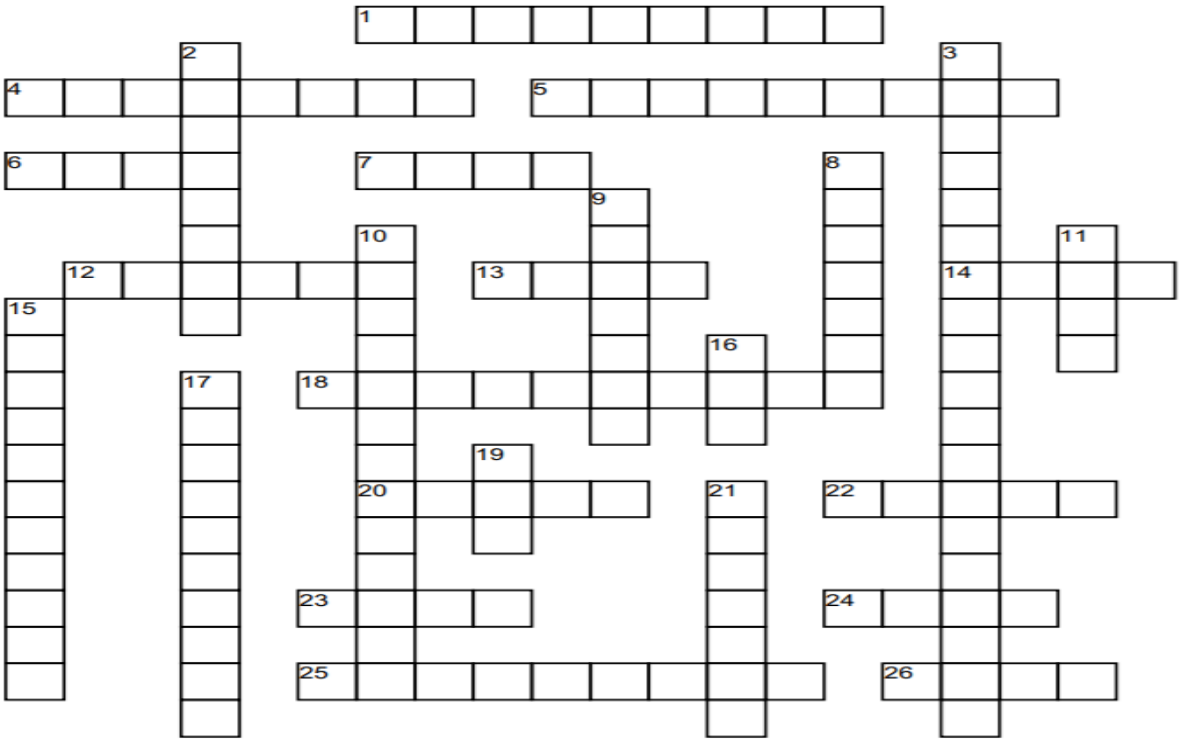
Material Advantage Chapter Officer's workshop:

Material Advantage Chapter Officer's workshop will take place on 23rd September 2021 from 11 am to 1pm via zoom. This is the virtual workshop where our committee and executive members are going to attend this.

Guest Lecture:

We are going to plan a special guest lecture for our Material Advantage Chapter.

Crossword



Across

1.Unfired pottery. Ready to be bisque fired.
4.Creating ceramic shapes on the potter's wheel
5.Clay forced through a die to form uniform shaped clay.
6.Clay mixed with water.50% water.
7. Creating a form with long, rope shaped, pieces of clay.
12.Pottery that has been fired once, without glaze, cannot be recycled. 0% water.
13.To heat a clay object in a kiln to a specific temperature.
14.A plaster shaped designed to pour slip cast into and let dry so the shape comes out as an exact replica.
18. The quality of the clay which allows it to be manipulated into different shapes without cracking. 25% water.
20. This is a coat of glass. An impervious silicate coating which is developed in clay ware by the fusion under heat of inorganic materials
22. To manipulate clay with your fingers in the palm to hollow a shape.
23. A furnace of refractory clay bricks for firing pottery and fusing glass.
24.Base of a ceramic form.
25. Technique of moving a clay into symmetrical rotating axis in the middle of a wheel head so you can throw it.
26.Pressed or rolled flat sections of clay used for hand-building.

Down

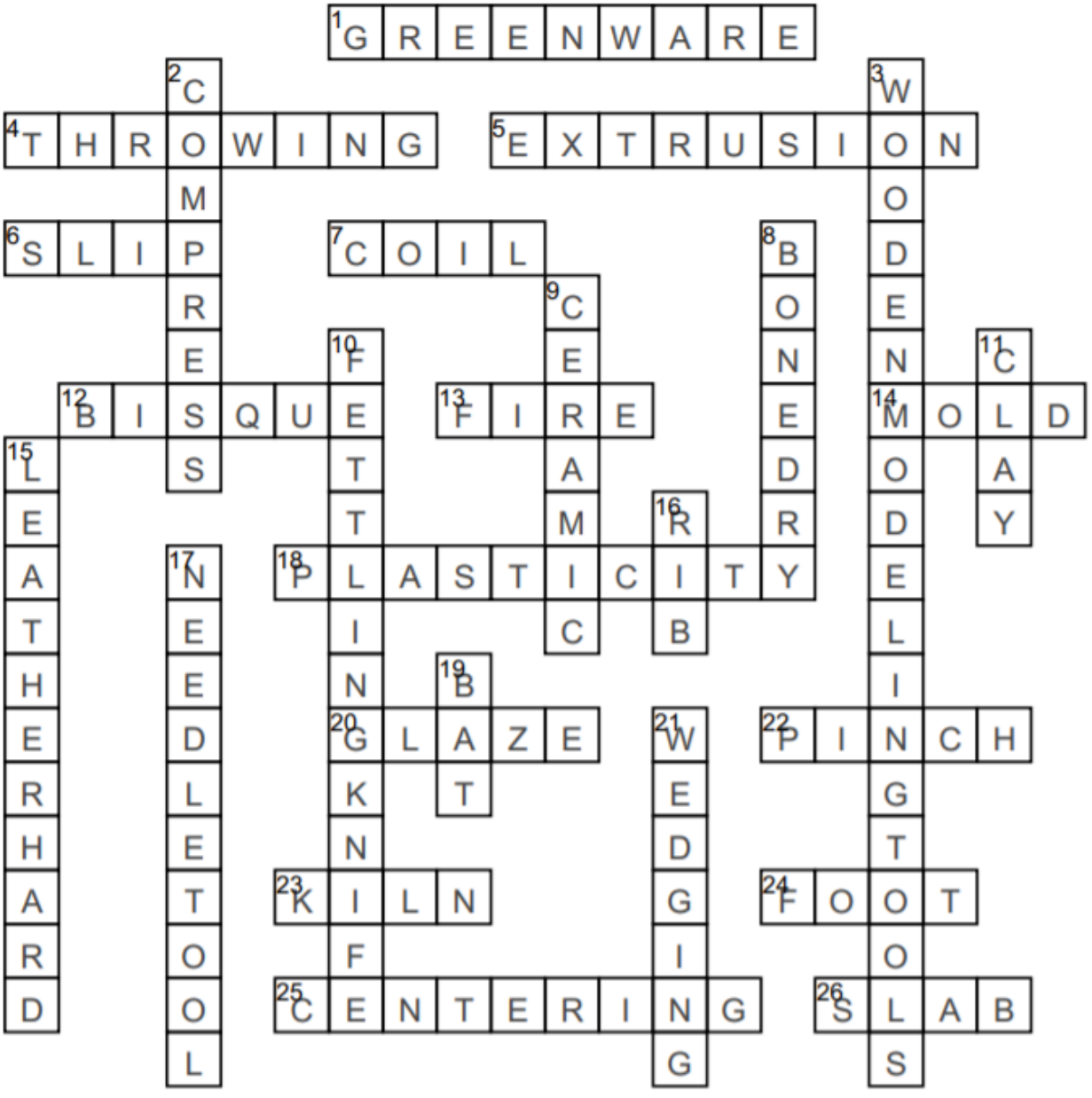
2. Pushing the clay down and together, forcing the particles together
3. These come in a variety of shapes, used in all sorts of hand-building. (3 words)
8. Completely air dried. 2% water.
9. A creation of an object out of clay.
10. Used for cutting large lumps of clay, cleaning edges of cast pieces (2 words)
11. A natural material extracted from the earth's crust. Made of alumina + silica + water
15. The stage of clay between plasticity and bone dry. 10% water (2 words)
16. A rubber, metal or wooden tool used to facilitate throwing on the wheel and finishing surfaces in hand-building
17. Long heavy needle with a handle, one of the most versatile tools in pottery
19. A flat disc made from plaster, wood, or plastic which is fixed to a wheel head.
21. A method of kneading the clay to make it evenly mixed.

Answers

Riddles:

Answer: Gold

Answer: Poly-jester!



Crossw

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WordPress*:* *https://materialadvantageccoew.wordpress.com/blog/*

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