

SPECTRUM

THE ASSAM VALLEY SCIENCE JOURNAL



Editor's Note

"Imagination is more important than knowledge"
-Albert Einstein

2020- the challenging year, that served us plates of moral lessons has finally bid its farewell. The New Year welcomes us with new hope of healing and blossoming while the AVS community brings to you the second edition of Spectrum. They say that learning never stops be it in the midst of a global pandemic or through this compilation of creativity by our very own fellow aviators. As you turn pages enjoy the journey through wonderful space, explore its hidden treasures and mysteries, delve into the wonderful tale of Jupiter and Saturn's reunion, dig into the possibilities of life beyond and much more. I urge you to fully savor the knowledge embedded, in the imagination of the students as you flip through these pages. Wishing you a pleasurable read!

Magdolina R. S. Lepcha

WHAT'S INSIDE

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To study pH level of Khar made from different varieties of Banana Peel

Priyanchi Sarma, 11SB and Dr. Alpina Dey

ABSTRACT:

Kolakhar, prepared from Banana peel; is an alkaline water that has been used by people of Assam, since times immortal. Along with its routine use as additive in cooking, Kolakhar had been used to treat various ailment due to its high alkaline content. It is also used to normalized digestive disorder of stomach. It is used by villager to wash cloths, shampooing hair, to kill leech and to prevent certain cattle diseases. This work has investigated the difference in the pH level of khar made from different species of Banana peels.

KEYWORDS:

Musa balbisiana, *Dwarf cavendish*, Kolakhar, pH, alkaline water.

INTRODUCTION:

A banana is an elongated, edible fruit - botanically a berry - produced by several kinds of large herbaceous flowering plants in the genus *Musa*. Almost all modern edible seedless (parthenocarp) bananas come from two wild species - *Musa acuminata* and *Musa balbisiana*. This research has focused on two species Bhimkol (*Musa balbisiana*, a local variety of Assam and commercially popular variety, *Dwarf cavendish*). Banana peels are used as food for animals, in water purification, for manufacturing of several biochemical products. On average, banana peels contain 6-9% dry matter of protein and 20-30% fiber. Green plantain peels contain 40% starch that is transformed into sugars after ripening.

KHAR:

Khar, is an integral part of Assamese

cuisine. Generally, lunch in Assam starts with khar. It is an indigenous product, an alkaline-based delicacy of Assam. It is prepared from the banana peel, as well as the trunk of the banana plant. The peel of aathiya or bheem kol (a particular variety of banana - *Musa balbisiana*) is the best for this preparation as its peel is thicker. This alkaline liquid is used regularly in almost every Assamese home.



Musa balbisiana
(Bhim kol)



Dwarf Cavendish
(Commercial variety)

METHOD:

Kolakhar was made in lab using traditional method.

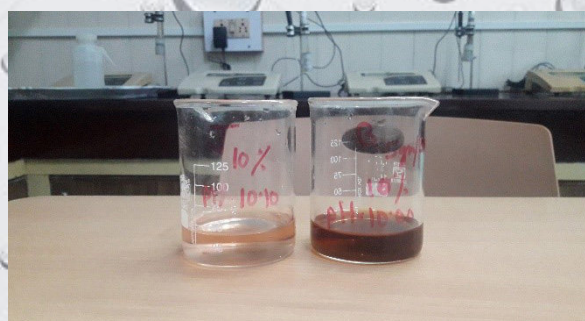
1. Dry the banana peel and burn the dried peel.
2. Collect the ashes and weigh it.
3. Prepare 10% solution of ashes and let it rest for about 12 hours.

4. After 12 hours or so the ashes will settle down at the bottom. Filter the clear water carefully. The filtered water is the kola khar.



Burning of peels Alkaline water (kolchar) after filtration

the varieties of bananas contain almost equal amount of potassium content. Potassium oxidizes to potassium oxide upon burning and when the ash is dissolved in water it forms an alkali, potassium hydroxide. However, there is significant difference in the physical appearance, one prepared from Bhim kol appears brown and the other one appears colourless.



CONCLUSION:

There is no significant difference in the pH level of both the khar therefore both the varieties can be used to prepare the khar for cooking purpose. The purpose of this study was to find out-Why only Bhimkol is used in Assam for preparation of khar? Here we can infer that Bhim kol is the local variety, easily available, it's liked by locals due to its taste and texture therefore its peels has been used for khar preparation since ages.

OBSERVATION TABLE

S.No	Banana Species	pH
1	<i>Musa balbisiana</i> ⁶ (Bhim kol)	10.0
2	<i>Dwarf Cavendish</i> ⁷ (Commercial variety)	10.1

RESULTS:

The results show that there is not much difference in the pH levels of khar, prepared from both the varieties of bananas. This indicates, both

ACKNOWLEDGEMENT:

Authors are indebted for the help and support of Mrs. Meenakshi B. Das and Mr. Rajib Hazarika, to carry out the experimentation work.

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SOME FICTION — SOME REALITY!

Magdolina R. Sada, 12SB ,Fazil R. Hazarika, 12SA

It was finally, time for them to meet. Separated by thousands of light year. were the ignorant two-too blinded by envy to notice their stars lined together, too busy desiring to hear the celestial astronomers singing the tale of their destiny together. Jupiter always considered himself to be of high nobility having being named after the Roman king of the Gods, and being seen as a notable astronomical object since ancient times by the habitants of the most advanced planet in the solar system, the Earth. However, he always envied Saturn for his brilliant and reflective rings which were eons time more beautiful than his. “Ah! Those blinding majestic rings”, he’d say “I so dearly wish I could replace mine with his’ “. Saturn, the gigantic gas giant slowly orbit its way towards Jupiter. Saturn loved the lusty mix of white, red, orange, brown, and yellow that made Jupiter’s appearance absolutely captivating. Being the lightest planet and always being entitled as the second largest in the solar system always made him feel inferior to Jupiter. How dearly he wished that he could be as majestic as Jupiter, for the first time he would be meeting his idol and he didn’t know what to make of it. Floating in the darkness, he could feel the gases rise faster than usual from his surface as the distance shortened between them.

Jupiter was awe-struck on seeing Saturn up so close than he had ever before, Saturn looked charming.

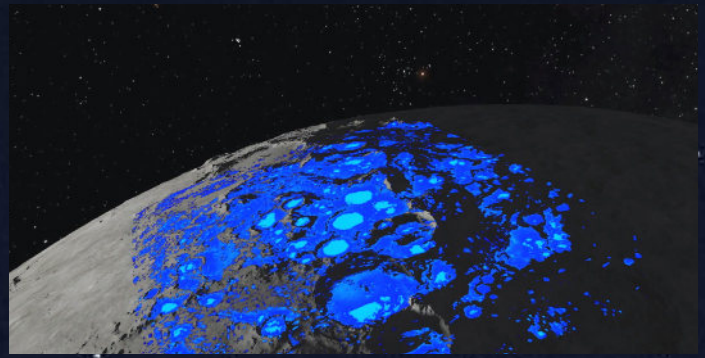
‘ Y-your ring’s beautiful!’ he stammered; he had never stammered before. Saturn could feel his rings become lighter as though it’d melt. He hadn’t thought that the biggest majestic planet would care to speak to him let alone compliment him. The next few hours went by in a swift as either one of them shared their admiration for one another. Saturn confessed to his idol about how he envied him for being the largest planet and having the largest moon count of 63, which aroused inferiority in him. Jupiter shared his admiration for Saturn having the most beautiful rings. Saturn declared how awesome it was that Jupiter was named after the noble king of the Gods. On hearing this Jupiter halted and when he started speaking his voice was much calmer and softer, “Saturn look at you, you’re the most beautiful planet with your lustrous ring of gases and rocks”. Jupiter let out a sigh followed by a twinkling smile as he spoke ‘You own the name of the Roman God of agriculture, the father of Jupiter himself! There’s no inferiority and superiority between us’. At that moment for the first time Saturn actually saw himself. He didn’t feel low or bad about himself anymore. Rather he felt accepted and finally realised his worth. He was so engrossed in admiring Jupiter, that he never noticed how rare and beautiful he himself was. Jupiter felt the same way. He enjoyed Saturn’s company and he now no longer held jealousy in his heart. This encounter had changed both of them drastically. They both understood each other well, and before they even realized it, they became the best of the friends. They now wait every twenty years, not with jealousy, but with warm hearts and eagerness to reunite with the one who taught them something that crafted them and made them whole. This reunion is called the Great Conjunction. The combined effect of Jupiter’s approximately 12 years of orbital period, and Saturn’s approximately 30 years of orbital period makes it a success.

GHOST WATER

Rayyan Hazarika, 10C

Water has recently been discovered on the sunlit surface of the Moon (Clavius Crater). Before this, it was thought that only cold and shadowed parts could harbour water. In the last century itself, many space organizations have proven the existence of ice and hydration on the Moon but were unsuccessful in determining the form in which it was present – OH or H₂O. This is the first discovery of water molecules on the sunlit surface of the Moon by SOFIA (Stratospheric Observatory for Infrared Astronomy), which is a plane that has a telescope attached to it. It can fly nearly fully above the ‘infrared – blocking’ part of the Earth’s atmosphere, enabling scientists to study the Moon in ways that are not possible with ground – based telescopes.

There are numerous possibilities of how these water molecules came to be on the sunlit part of the lunar surface. The Moon is no stranger to meteorites as proven by the numerous craters on its surface. Firstly, micrometeorites (small meteors) which contain water crashed into the



Lunar surface. Secondly, solar winds from the sun bring hydrogen to the moon’s surface which then react with the oxygen – bearing minerals and forms ‘hydroxyl’ (OH). This ‘hydroxyl’ then is converted to water due to the radiation by micro meteors. There are two possibilities of the storage of this water. Firstly, this water can be stored in ‘beadlike’ structures in soil formed due to heat and pressure because of micro meteor impacts. Secondly, it may be stored in between granules of soil unexposed to sunlight. Now there are important implications of this discovery. NASA’s VIPER (Volatiles Investigating Polar Exploration Rover) mission, which plans to make a map of the moon, would show water concentrations on the Moon for future human exploration. Water contains oxygen and hydrogen which are fundamental for our existence. In the future, when humans would go to live on the Moon, we can produce oxygen and hydrogen through electrolysis and also use these gases and water itself for many other uses.

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Hand Sanitizer-

A necessity of present time

Kuhu Bakliwal, 11SB

D I Y
O T U
R S
E L F

Let's make it at Home-

It is absolutely herbal and does not have any side effects.

INGREDIENTS:

1-liter water
100 neem leaves
10-20 basil leaves
10 grams alum
10 grams camphor
Aloe vera

PROCEDURE:

- First, put 100 grams of neem leaves in 1 liter of water.
- After that, add basil leaves and boil them well in water. Now put aloe vera in it.
- When the water boils well and about 600 to 700 mL of 1 liter is left, then add camphor and alum in it.

Note: This sanitizer is prepared as per age old practices but not yet tested against corona virus.

CRISPR/CAS9- Genetic Scissors

Anushcka Joshi, IISA



Emmanuelle Charpentier



Jennifer Doudna

THE FIRST FEMALE RECIPIENTS OF THE NOBLE PRIZE CHEMISTRY

In 2012, Emmanuelle Charpentier and Jennifer A. Doudna discovered one of Gene's sharpest tools, the CRISPR/CAS9 genetic scissors. With the achievement of this revolutionary method for genome editing, researches can alter the DNA of animals, plants and microorganisms with extremely high precision. In the field of life sciences, it has tremendously contributed to new cancer

therapies as well as increase, the possibility of curing inherited diseases. For the development of CRISPR/CAS9, The Royal Swedish Academy of Sciences has awarded the Nobel Prize of Chemistry 2020 to Emmanuelle Charpentier of the Max Planck Unit for the Science of Pathogens, Germany and Jennifer Doudna of the University of California, Berkeley, US. This is also going to go down as a promising achievement for women in history, as Emmanuelle Charpentier and Jennifer Doudna are the first all-female recipients of Nobel Prize in Chemistry.

Wow! Women here is your solution to a permanent hair makeover!

KIDS' CORNER

My Incredible Skeleton

Adrika Dey, 5A

My day was really tiring
My joints are in terrible pain,
Oh! God please help me
My muscles are also in extreme pain.

Thanks to my limbs
At least I made till home,
If they wouldn't have been with me
I would have never reached home.

Oh! My backbone
You are really very diligent,
You take the weight
Of my whole bulky body.

Oh! My dear skeleton
I appreciate you a lot,
You are the only one
Who helps everyone do their daily different jobs.

Some interesting facts about Bones and Skeleton system

Benjamin MacDonald, 5B

1. Your skeleton is made of more than 200 bones.
2. Bones are filled with a spongy tissue.
3. Babies are born with 300 bones.
4. The smallest bone in the body is in your ear.
5. The longest and the strongest bone is in your leg- the thigh bone (femur).
6. More than half of your bones are in your hands and feet.
7. The hyoid bone, which is in your throat, is the only bone that doesn't connect to a joint. The hyoid is responsible for holding your tongue in place.
8. Human skulls look different depending on if they are male or female, and depending on what part of the world they come from.
9. One out of every 200 people are born with an extra rib.
10. The collagen in bone constantly replenishes itself. So about every 7 years, you have a new skeleton.

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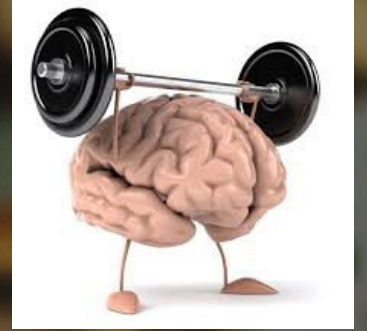
Winners – UNSCRAMBLED WORD SPECTRUM VOLUME-1

Mrs Chayanika Barua
Ms. Niharika Goswami
Ms. Shabahat Sabir Ansari

Brain Gym

COME HAVE FUN WITH BONES AND MUSCLES

Aadyaa Vimal, 5A

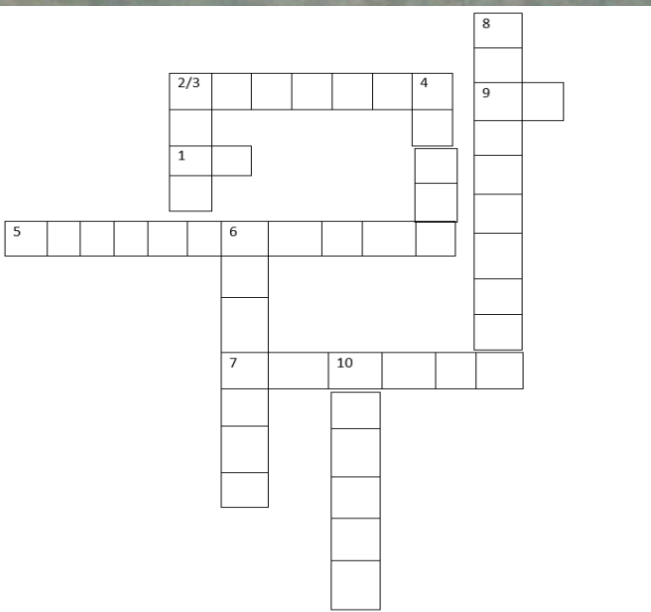


M	F	E	M	U	R	A	I	S	S
A	N	H	G	S	Q	U	O	K	K
L	S	T	A	P	E	S	P	U	E
L	W	Z	X	V	T	Q	U	L	L
E	C	A	R	D	I	A	C	L	E
U	B	A	C	K	B	O	N	E	T
S	A	N	G	F	K	Y	M	O	A
H	U	M	E	R	U	S	B	P	L
D	C	A	R	T	I	L	A	G	E
B	O	N	E	M	A	R	R	O	W

1. Smallest Bone in the body.
2. Longest bone in the body.
3. Substance help in protecting Bones.
4. It is made up of 22 bones.
5. Bone helps in hearing.
6. Bones forms a system.
7. Spinal cord is protected by a bone.
8. Muscles found in heart's wall.
9. Bone present in the upper limb.
10. RBC produces inside the bones.

CROSSWORD PUZZLE

Ronit Datta Roy, 5A



ACROSS

1. A Male Cow is called.
3. What part of a body helps to Move?
5. Which pigment gives the leaves, its Green colour?
7. Similar body cells group together.
9. What is the Chemical symbol of Radium?

DOWN

2. What is Earth's Only Natural Satellite?
4. What part of the skeletal system protects the brain?
6. Which nutrient plays an essential role in muscles building?
8. A single piece of coiled DNA is called?
10. One of the smallest bones in the human Body.

ENCELADUS

Sampurnam Sarkar, 8A

EENCELADUS the sixth-largest moon of Saturn is named after the giant Enceladus from Greek Mythology. It's a smooth satellite of Saturn having more reflective brightness than any other celestial body in the Solar System. It is mostly covered with fresh and clean ice. Enceladus was first discovered by William Herschel on August 1789, but little was known about it until Voyager 1 and Voyager 2 passed nearby it in the 1980s. It was in 2005, Cassini revealed its surface's environment in higher details. The great story that comes from the Saturn System is from this tiny moon Enceladus with a diameter of only 500 km. It is perhaps the must-go-to place in the Solar System to search for life. This tiny bright ball is hiding within the Saturn's E-Ring. The Magnetometer team of NASA found that the magnetic field of Saturn was deflected to the side. As the team went closer, they noticed a change in brightness and saw material coming out of the South Pole of Enceladus. The team found something extraordinary, more than 100 enormous geysers, shooting water and ice crystals out in the space from a snowy white surface. The mystery of the Enceladus is that the South Pole is hot. The source of the water lies in a subterranean ocean or sea hidden beneath the icy crust in the South Pole, warmed by tidal heating. It's a mystery as Enceladus is small and is not supposed to have that much heat source that melts water underground. Enceladus is currently geologically active. There are macromolecular organics on Enceladus's jet plumes as sampled by Cassini. It's believed that earliest known life forms

on Earth were found in hydrothermal vent precipitates. Enceladus too has hydrothermal activities, it has:

1. Water Source
2. Energy Source
3. Organic Material Source
4. Nitrogen Source
5. Carbon dioxide

A necessity for life. It's really a must-go place in our Solar System for further investigation and astrobiological importance. There is a high possibility that the activities in Enceladus could be a potential oasis of habitability. The presence of ample hydrogen in Enceladus's ocean means microbes –if it exists – could be used it to obtain energy by combining the hydrogen with carbon dioxide dissolved in the water. The chemical reaction is known as "methanogenesis" because it produces methane as a byproduct and is at the root of life. Maybe Enceladus is a habitat for some kind of organisms that is very different from those found on Earth. There is a high probability for life in this tiny satellite of Saturn.

Taking all things into account I think, Enceladus wins over other celestial bodies in our Solar System such as Mars, Europa, Titan, etc. for the search of life outside our mother Earth.

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STAR WARS IS NOW

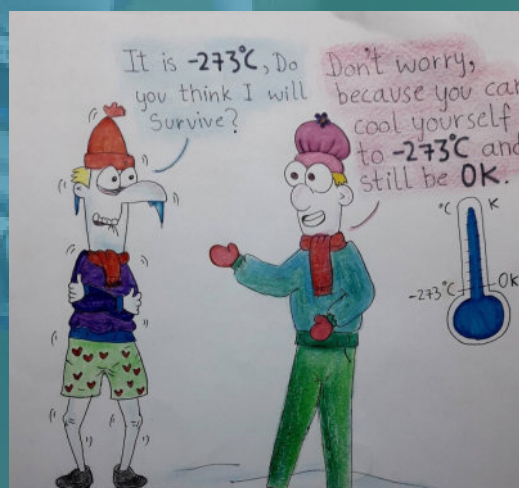
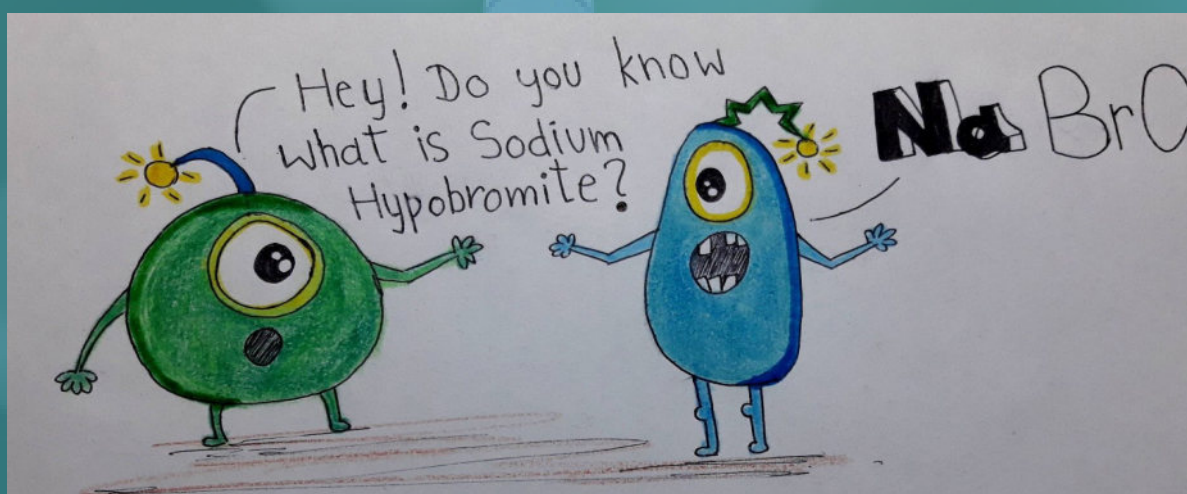
Anushka Joshi, 11SA

On 15th January 2021, 11:32 hours, at the Cariappa Parade Ground in Delhi cantonment, New Delhi an amazing feat was accomplished. 'Is it a plane, is it a bird, is it superman!' - reiterating the iconic line, the crowd whispered with baffled glances seeing a bunch of dark robotic platforms rising majestically in the air. 'Up ahead you can see the drone swarms!' announced the commentator with added gusto. India on Friday, for the first time displayed its determination to deploy drone swarms for offensive military operations of the future. So what's great about a drone swarm? A commentary in US War journal defined drone swarms as "multiple unmanned platforms and weapons deployed to accomplish a shared objective, with the platforms and weapons autonomously altering their behaviour based on communication with one another". The dynamic demonstration on Friday, included Kamikaze kinetic attacks on dummy enemy targets like tanks, helipads, radars, fuel dumps and terror camps by "child" drones which were liberated by "mother" drones. Followed by first aid delivery, parachute payload delivery, paradrop and "hover and drop" missions. It happened like magic, with the drones criss-crossing amongst each other, responding to the software like a well-oiled machine. The rotary-wing quadcopter and multi-copter drones, weighing from 5-25 kgs, have been developed by the Army in collaboration with a Bengaluru based start-up, Newspace Research and Technologies. The mock operations were carried out by a swarm of 75 drones (including the "mother" and the "child" drones) which executed an array of autonomous commands enabled through a multiplex interface between on board computers, adaptive Artificial Intelligence(AI), algorithms, advanced photometry and edge computing for better target destination. Devoid of human interaction, these were driven by continuous satellite feeds, digital terrain scene analysers and area correlation techniques which aimed to enhance radars and air defences, dulling the enemy's capability to response to identify their quick movement. The demonstration portrayed the "mother" drones releasing the "child" drones, which then realigned and oriented themselves with respect to the targets. The onboard computers then used complex, advanced AI algorithms to optimise

attack trajectories armed with explosives. In a flash the drones crashed into the targets in Kamikaze strikes (detonating themselves). 'This milestone in disruption in warfare', as Bharat Bhushan Babu, principal spokesperson of the ministry of defence tweeted, 'these can enter 50 km inside enemy territory and carry out independent military tasks, as well as deliver up to 600 kg of supplies to troops. The 'drone swarms' are a new fighting concept to India, and this event marked a small beginning to the extensive use of drone swarms in overwhelming air defence capabilities of the adversary in the future. But it needs to be much more, as observed in the drone propelled victory of Azerbaijan over Armenia last year. With the evolution in drone numbers, from a mere number of 5 drones last August, 20 in October, 35 in December and now 75, India hopes to achieve a swarm of 1,000 drones in the future. Yes, that would be an incarnation of the Star Wars, wouldn't it!

HUMOUR IN SCIENCE

Anvita Dey, 9A



GRAPHENE

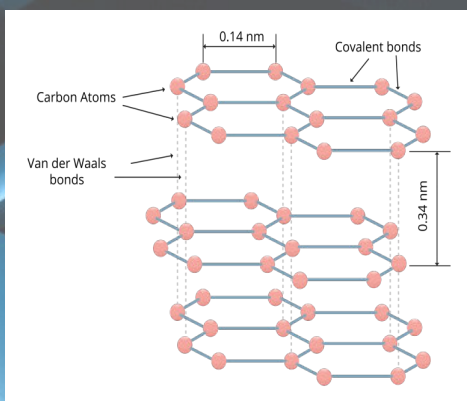
Abhay Kejriwal, 12SB

What is Graphene?

Graphene is a single sheet of carbon atoms with incredible properties – it's 200 times stronger than steel, harder than diamond, and incredibly flexible. It is so strong that using just 2 layers of it you can stop a bullet.

Yes, I know there are plenty of strong materials out there but why Graphene? It is special because of how easily it is available. Actually, everyone uses it on a regular basis. You might even be using it now unknowingly. Confused! Let me clear it up for you.

Graphene is a one-atom-thick layer of carbon atoms arranged in a hexagonal lattice and is actually the building-block of Graphite, the same material used in pencil leads. Yeah, Graphite is actually formed with multiple Graphene layers stacked upon one another.



You must have probably seen this image in your textbooks. But did you know that when one of those layers of carbon, that forms graphite, is isolated, it is Graphene. Even though it is isolated from Graphite, Graphene is a remarkable substance on its own – with a multitude of astonishing

properties which repeatedly earn it the title “wonder material”.

Graphene’s properties

Graphene is the thinnest material known to man at one atom thick, and also incredibly strong – about 200 times stronger than steel. On top of that, graphene is an excellent conductor of heat and electricity and has interesting light absorption abilities. It is truly a material that could change the world, with unlimited potential for integration in almost any industry.

Potential applications

Graphene is an extremely diverse material, and can be combined with other elements (including gases and metals) to produce different materials with various superior properties. Researchers all over the world continue to constantly investigate and patent graphene to learn its various properties and possible applications, which include:

- batteries
- transistors
- computer chips
- energy generation
- supercapacitors
- DNA sequencing
- water filters
- antennas
- touchscreens
- (for LCD or OLED displays)
- solar cells

Producing graphene

Graphene is indeed very exciting, but producing high quality materials is still a challenge. Dozens of companies around the world are producing different types and grades of graphene materials - ranging from high quality single-layer graphene synthesized using a CVD-based process to graphene flakes produced from graphite in large volumes.

Graphene products

Several companies offer graphene and graphene based products.

In December 2011 Vorbeck Materials said that the Siren anti-theft packaging device, which uses their graphene-based Vor-Ink circuitry, has started shipping - and this was the world's first commercially available product that is based on graphene.

The sport industry has adapted it in 2013 and started shipping graphene-enhanced tennis rackets (called YouTek Graphene Speed series). Today one can buy graphene-enhanced helmets, ski equipment and even Lacrosse gear.



Graphene has also entered the consumer electronics market - for example Huawei's Mate 20 X smartphone, uses "graphene film cooling technology" for heat management purposes.

Another high-profile company that adopts graphene is Ford - which is using graphene-reinforced foam covers for noisy components in its 2019 F-150 and Mustang cars. The

graphene is mixed with foam constituents, and the resulting parts are said to be 17% quieter, 20% stronger, and 30% more heat-resistant.



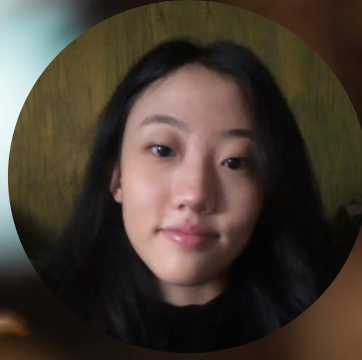
Graphene-based batteries are quickly becoming more favorable than their graphite predecessors. Graphene batteries are an emerging technology which allows for increased electrode density, faster cycle times, as well as possessing the ability to hold the charge longer thus improving the battery's lifespan. "Real Graphene" is a one such company focused on developing graphene-based batteries that are better, fast charging, long lasting and are safer to handle.

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