

## **Structural Coloration**

**Prelims:** Science and technology | Current events of national and international importance

## Why in news?

Recently, scientists at the Centre for Nano and Soft Matter Sciences (CeNS) have now found a way to harness a property known as structural coloration.

**Centre for Nano and Soft Matter Sciences (CeNS),** an autonomous institute of Department of Science and Technology (DST) under Ministry of Science and Technology is located in Bengaluru.

- **Structural coloration** It refers to colors in materials that is caused a result of the physical structure of the material.
  - **Example**: The <u>colour of the peacock's feathers</u> & radiant <u>wings of a butterfly</u> change depending on how you look at it, varying between shimmering blues and greens.



• **Research work** – It explores how size-reduced monolayers of self-assembled polystyrene (PS) nanospheres exhibit <u>angle-dependent optical properties</u> due to collective light-matter interactions within the monolayer.

Structural colors arising from nanoscale geometry can be finely tuned by <u>varying both the size of</u> <u>colloidal spheres</u> and the <u>angle of light incidence</u>.

- **Polystyrene Nano spheres** These are about 400 nanometers wide which <u>naturally arrange</u> <u>themselves</u> into a flat, hexagonal pattern when floated on water.
- This self-assembly, driven by simple surface forces, results in what the scientists call a *close- packed monolayer*.
- **Reactive ion etching** It is a kind of *nano-scale sandblasting*, to gently shrink the spheres without disturbing their neat arrangement once a monolayerr is formed.
- This size reduction leads to a "non-close-packed" layout.
- **Property of light** It behaves differently as it hits the altered surface.
- When light reflects off this nanostructured layer, its interaction with the tiny spheres causes <u>certain wavelengths (colors) to be amplified or diminished.</u>
  - **For instance**, by tilting the surface or changing the viewing angle, the reflected color shifts—typically towards blue.

- This phenomenon is predictable and tunable due to the way in which the spacing and size of the spheres affect light's path.
- Advantages They do not rely on harmful dyes or complex fabrication processes and are durable and vibrant.
- **Applications** It is used to <u>create tunable color-shifting materials</u> using tiny plastic beads that can be used for
  - $\circ$  Wearable sensors, anti-counterfeit tags, display technologies and even eco-friendly paints.

Reference

PIB| Tuning Structural Coloration in Laboratory

