



drishti

Superhydrophobic Coating on Metallic Surfaces

 drishtiias.com/printpdf/superhydrophobic-coating-on-metallic-surfaces

Why in News

- A team from the Indian Institute of Technology (Indian School of Mines), Dhanbad, and Ohio State University has created a superhydrophobic coating to save steel from rusting.
- The coating was made from **polyurethane and silicon dioxide nanoparticles**.

Superhydrophobic Surfaces

- The term hydrophobicity is derived from two greek words that are **hydro (water)** and **phobos (fear)**. It is the ability to **repel water**.
- Superhydrophobic coating is a nanoscopic surface layer that repels water.
- Adding a superhydrophobic coating makes a surface liquid and water repellent, easy to clean, and boosts its anti-icing performance (ability to delay the formation of ice for a certain period of time)
- Super-hydrophobic coatings are also found in nature; they appear on plant leaves, such as the Lotus leaf, and some insect wings.
- Apart from steel the coating can be done on **other metallic surfaces, such as aluminum, copper, brass**. The coatings have also been **developed for glass, cloth, paper and wood**.
- Developing an antimicrobial superhydrophobic coating for biomedical applications is also being worked on.
- Without this, the coating tends to easily peel off due to smoothness of steel.
- The spin coating was found to be more **advantageous and cost-effective** compared to immersion coating and spray coating.

Spin coating **dried quickly** and the thickness of the coat could be controlled easily

Silicon dioxide

- Silicon dioxide (SiO₂), also known as silica, is a natural compound made of two of the earth's most abundant materials: silicon (Si) and oxygen (O₂).
- Silicon dioxide is most often recognized in the form of quartz. It's found naturally in water, plants, animals, and the earth.

Polyurethane

- Polyurethane **is a polymer composed of organic units joined by urethane links.**
- It is a plastic material, which exists in various forms.
- They are used in a wide variety of applications to create all manner of consumer and industrial products that play a crucial role in making our lives more convenient, comfortable and environmentally friendly.

Properties of the Coating

- **Chemically Stability: Stable in both acidic (pH 5) and alkaline (pH 8)** conditions for more than six weeks.
- **Thermal Stability:** Stable up to 230 degree C.
- **Mechanical Stability:** Highly stable when tested with water jet, floating, bending, sand abrasion tests.
- **Self-cleaning**
 - When water droplets were made to fall on an uncoated surface they stuck to it and made a messy surface.
 - However, in the case of a coated sample, water droplets roll away while collecting dust from the surface.
- **Easy to make**
 - The chemicals used to make the coating are easily available and are also environmentally friendly.
 - The cost of coating will further reduce when mass-produced on commercial scale.

Source: TH