



## Nanocomposite Coatings

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### Why in News

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A group of scientists at the **International Advanced Research Centre for Powder Metallurgy & New Materials (ARCI)**, an **autonomous R&D center of the Department of Science & Technology (DST)** have developed a process for size-selective deposition of nanocomposite coatings.

### Key Points

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- Nanocomposite coatings are formed by mixing two or more dissimilar materials at nanoscale to **improve the physical, chemical and physicochemical properties** of the new materials.
- The scientists have found that **nickel tungsten-based coatings** with infusion of **particular sized Silicon Carbide (SiC) submicron particles** using a **pulsed electroplating** can provide an excellent combination of **wear and corrosion resistance**.

### Need for Nanocomposite Coatings:

- Several **aerospace, defence, automobile, space devices** need to reduce friction, wear, and tear to enhance the life of components.
- Lubricating these dynamic systems add to the **cost, complexity, and weight** of these systems.
- The coating **could help in reducing the friction** of such devices.

### Advantages of the Process

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- The nanocomposite coating demonstrated excellent **tribological behavior** (science and engineering of interacting surfaces in relative motion, which includes principles of friction, lubrication, and wear) compared to other wear-resistant coatings.

- The coatings **withstood 1000 hours of salt spray (corrosion)** without degradation when compared to conventional wear-resistant coatings.
- The process is **highly economical without environmental constraints.**

## **Electroplating**

- Electroplating or electrodeposition is a process that employs an electrical signal provided by an external power source to reduce cations of a desired metal in solution and produce a **metallic coating.**
- It involves the metal parts to be immersed in an electrolyte bath solution.
- In this case, it is typically prepared by dissolving crystals of Nickel (Ni) and Tungsten (W) salts in a mix of distilled water and other additives.
- A Direct Current (DC) is passed through the solution, and the resulting reaction leaves a deposit of Ni-W alloy on the piece being plated.

### **Size-Selective Electrodeposition:**

For size-selective electrodeposition, Pulse Current (PC) electrodeposition – **intermittent application of current** is used in place of conventional Direct Current (DC) deposition.

**Source: PIB**