



# Advanced Biodegradable Nanocomposite Film

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## Why in News?

Recently, researchers from the **Institute of Advanced Study in Science and Technology (IASST), Guwahati**, have successfully fabricated a **biodegradable nanocomposite film** with **optical and mechanical properties**.

## What are the Major Highlights of the Research?

- The research encompasses the **utilization of polymers**, which have become essential in various industries due to their **adaptability and versatility**, spanning from **packaging to medical equipment**.
  - However, advanced applications like flexible displays and **organic LED technology** necessitate highly flexible and optically active polymers.
  - To attain these desired properties, **researchers have delved into the incorporation of nanomaterials**.
- Among the selection of synthetic **biodegradable polymers**, **polyvinyl alcohol (PVA)** has **emerged as a standout choice**. PVA boasts exceptional **film-forming capabilities** and robust mechanical properties.
  - Furthermore, it can be **tailored for optical and mechanical attributes** by introducing suitable nanomaterials.
  - The research team successfully **created a biodegradable PVA-CuO nanocomposite film** using a **straightforward solution casting technique**, where **copper salt** served as a precursor for the in-situ formation of CuO nanoparticles under varying heat treatment conditions.
- This nanocomposite film demonstrated **superior optical, mechanical, and antimicrobial features** when compared to pure PVA films.
  - The existence of CuO nanoparticles within the polymer matrix was verified through a range of **spectroscopic and microscopic techniques**.

## Polymers:

- **Polymers** are **large molecules composed of repeating subunits called monomers**. These molecules are essential in various fields, including **chemistry, materials science, and industry**.
  - They have a wide range of properties and are used in everyday products, such as **plastics, rubber, and fibers**.
  - **Biodegradable polymers** are a type of polymer that can **break down naturally into environmentally friendly substances** over time.

## Nanomaterials:

- Nanomaterials are engineered at the **nanoscale**, with a particle size of **less than 100 nm in at least one of its dimensions**.
  - Their structures and properties are significantly different from those of bulk materials due

to their small size.

### **Nanocomposite Film:**

- A nanocomposite film is a **thin, layered material** consisting of a polymer matrix integrated with nanoparticles or nanomaterials.
  - These films are designed to **combine the unique properties of nanomaterials with the advantages of the polymer matrix** to achieve specific desired characteristics.

### **UPSC Civil Services Examination Previous Year Question (PYQ)**

#### **Prelims:**

**With reference to the use of nanotechnology in the health sector, which of the following statements is/are correct? (2015)**

1. Targeted drug delivery is made possible by nanotechnology.
2. Nanotechnology can largely contribute to gene therapy.

**Select the correct answer using the code given below:**

- (a)** 1 only
- (b)** 2 only
- (c)** Both 1 and 2
- (d)** Neither 1 nor 2

**Ans: (c)**

#### **Mains:**

**Q.** What do you understand by nanotechnology and how is it helping in the health sector? **(2020)**

**Q.** Why is nanotechnology one of the key technologies of the 21st century? Describe the salient features of Indian Government's Mission on Nanoscience and Technology and the scope of its application in the development process of the country. **(2016)**