

# Vimala College (Autonomous) Thrissur



Post Graduate Department of Chemistry

## Standard Operating Procedure for **Synthesis of Nanomaterials**

Funded by  
DBT STAR College Scheme  
Department of Biotechnology  
Government of India

June 2023

# Standard Operating Procedure

## Nanomaterials

### Section 1 – Laboratory Information

Building/Room(s) covered by this SOP:	Chemistry lab
Department:	Chemistry
Laboratory Experiment	Synthesis of nanomaterials

### Section 2 – Scope

This standard operating procedure (SOP) is intended to provide guidance on how to safely store, handle, use, and dispose of nanomaterials in chemistry laboratory. Nanomaterials are defined as the materials having at least one external dimension, or an internal structure of 100 nm or less. They show properties different from bulk samples of the same material. The synthesized nanomaterials can be of different sizes and shapes and their physical appearance can be powder, colloid/suspension, or supported over a solid matrix. In any case small amount of dry samples (less than 50 milligrams) will be handled.

### Section 3 – Potential Hazards

The primary routes of exposure for nanomaterials are inhalation, skin contact, and ingestion. Nanomaterials prepared or used in laboratory experiments will likely be in one of three forms: a powder, in colloid/suspension, or in a solid matrix. The physical form of the nanoparticle will greatly influence the exposure potential. The inhalation exposure risk increases from nanomaterials in a solid matrix to nanomaterials in suspension to aerosolized nanomaterials.

Some common tasks that present some potential for exposure include:

- Working with nanomaterials without gloves

- Working with nanomaterials in suspension/colloid during pouring or mixing where stirring is involved
- Handling nanoparticle powders
- Washing glasswares used to synthesize/store nanomaterials
- Cleaning up spills or waste materials
- Mixing/powdering nanomaterials

#### **Section 4 – Exposure Controls**

The factors that will influence the exposure risk include the physical form of material, the quantity of material used or generated, and the frequency and duration of exposure. Every effort should be made to avoid releasing nanomaterials into the air.

#### **Engineering Controls**

If aerosols may be produced, nanomaterials (and any suspensions of nanomaterials) must be handled in a chemical fume hood. Aerosols may be produced during any open handling of dry powder, and during open or pressurized manipulations of suspensions.

#### **Administrative Controls:**

Some administrative controls that should be considered include:

- Providing known information to staff and students on the hazardous properties of the nanomaterial precursors or products
- Education of staff and students on the safe handling of nanomaterials

**Hygiene Measures:** Avoid contact with skin, eyes, and clothing. Wash hands before breaks and immediately after handling the nanomaterials.

**Hand Protection:** Wearing nitrile gloves is recommended for low volume measurements. Use proper glove removal technique to avoid skin contact.

**Eye Protection:** Properly fitting safety glasses or chemical splash goggles are required.

**Skin and Body Protection:** Laboratory coats must be worn and be appropriately sized for the individual and buttoned to their full length. Laboratory coat sleeves must be of sufficient length to prevent skin exposure while wearing gloves.

**Respiratory Protection:** Nanomaterials should be in conjunction with proper engineering controls, such as a chemical fume hood. However, if nanomaterials must be used outside of a chemical fume hood, respiratory protection may be required.

### **Section 5 – Special Handling and Storage Requirements**

- Avoid contact with skin, eyes, and inhalation.
- Avoid handling nanomaterials in the open air
- Store dispersible nanomaterials, whether suspended in liquids or in a powder form in closed containers whenever possible. Store in a cool, dry, and well-ventilated area.
- Clean up the work area at the end of each work with wet wiping methods. Cleanup should be conducted in a manner that prevents staff and students coming in contact with nanomaterials.

### **Section 6 – Spill and Accident Procedures**

All spills involving nanomaterials should be treated like a hazardous material spill and cleaned up immediately. Immediately evacuate area and ensure others are aware of the spill.

### **Section 7 – Waste Disposal Procedures**

Since the toxicology and environmental fate of nanomaterials is still largely unknown, all nanoparticle waste (solid material and liquids) should be conservatively managed as hazardous waste. This also includes any debris (i.e. vials, plastic, cloths) that has become heavily contaminated with nanomaterials. All nanoparticle waste must be placed in an appropriate container and labelled.