

# Nanoparticles Safety Policy & Procedures

## Purpose

The purpose of this document is to outline the health and safety policy for working with nanoparticles at 4D LABS. This document discusses procedures for permissible work area, personal protective equipment (PPE), handling, storage, waste disposal, and spill response.

## Introduction

A particle of dimension between 1-100 nanometers (nm) may be classified as a nanoparticle. Nanoparticles are often handled in aqueous solution, though they may also exist in dry powder form. There are limited studies regarding the safety hazards of nanoparticles, however, several hazards have been proven to be dangerous to human health. Thus, the best practice is to utilize multiple safety controls to mitigate the hazardous effects of accidental exposure.

## Work Area

All nanoparticle sample preparation must be done inside a fume hood. Working inside a fume hood minimizes exposure to potentially harmful gases, vapours, aerosols and fumes. The sash also provides a physical barrier that can protect from splashes and debris. An exception may be permitted in the event the user must work with dry nanoparticle samples, e.g. powders. In such cases, the fume hood air velocity may risk dispersing the nanoparticles inadvertently. The user must receive permission from 4D LABS prior to any work involving nanoparticles outside a fume hood.

4D LABS has a dedicated nanoparticle workspace fume hood, designated Wetbench #9, located in TASC2 room 6074 (see Figure 1). This area is most often used for hand spraying of nanoparticle solutions. Users must abide by the PPE requirements when working within the fume hood (see PPE section). The fume hood must be lined with clean aluminum foil at all times. If the foil is contaminated at any point, it must be replaced immediately and disposed of as nanoparticle waste (see Waste Disposal section). Additionally, all

work must be done on top of clean disposable absorbent liners (see Figure 2). These prevent the aluminum foil from being contaminated and provide a second layer of protection.

When working inside Wetbench #9, the sash should be at or below the indicated recommended height and all materials within should be located at least 15cm behind the plane of the sash. The fumehood should be clear of any obstructions and unnecessary chemical containers to ensure good air flow.

Finally, users must not leave behind any samples, chemicals, or equipment when concluding their work. The fume hood should be clean and free of clutter at the end of each user session.



Figure 1: Dedicated Fumehood (Wetbench #9) for Nanoparticle Sample Preparation

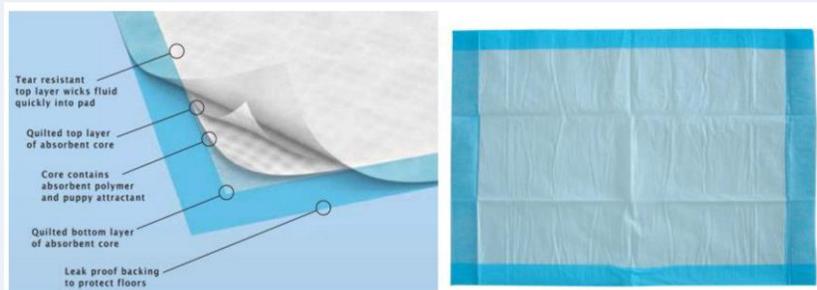


Figure 2: Absorbent Liner Available from Science Stores

## Personal Protective Equipment (PPE)

PPE must be worn at all times. This includes (but is not limited to): a lab coat, goggles and gloves. The standard nitrile gloves provided are suitable for work with solvents. However, users must consult with 4D staff prior to work with chemicals other than solvents in order to assess glove compatibility. Double gloving is required for any high risk activities. High risk activities include any work that is likely to cause contact with nanoparticle materials and/or related by-product or waste. Such activities include (but are not limited to): hand spraying, spin coating, synthesis, and/or solution transfer. There may be other situations that warrant double gloving, thus, a thorough risk assessment must be done prior to commencing work. When the outer gloves are contaminated, they must be removed by peeling them off and onto themselves in order to contain any nanoparticles; subsequently the outer layer gloves are included in the nanoparticle waste to be disposed. Meanwhile, the inner gloves should remain as a clean and uncompromised layer of safety between the work environment and skin, allowing for further work or completion of work. When finished work, users must remove the final layer of gloves and wash their hands prior to exiting the room.

## Waste Disposal

All solid nanoparticle waste must be contained in a zip-lock bag, labelled with a felt pen indicating 'nanoparticle' and materials contained, and placed within the designated waste bin located in TASC 2 room 6076 (see figure 3). Examples of nanoparticle waste are gloves, absorbent liners, aluminum foil, and/or any items that have or have potentially been contaminated with nanoparticles.



Figure 3: Dedicated Waste Bin for Nanoparticle Waste Located Inside TASC2 Room 6076

All liquid/chemical nanoparticle waste must be disposed into the appropriate 5L white/translucent container and labelled accordingly (see Figure 4). Do not fill beyond the “max. fill line” (75% full). The general waste container for nanoparticle solutions is located underneath Wetbench #9.

**Chemical Waste**

**CONTENTS**  
 Use full chemical name, no formulas, and no abbreviations

1. \_\_\_\_\_ %  
 2. \_\_\_\_\_ %  
 3. \_\_\_\_\_ %  
 4. \_\_\_\_\_ %

**HAZARDS**

Flammable  Toxic/Poison  Air/Water Reactive  Corrosive  
 Corrosive  Other: \_\_\_\_\_  
 pH if known: \_\_\_\_\_

Mark date when full or ready for pickup

Date (mm/dd/yy) \_\_\_\_\_ Quantity \_\_\_\_\_ L

Building \_\_\_\_\_ Room # \_\_\_\_\_ Phone \_\_\_\_\_  
 Lab contact name \_\_\_\_\_ Email \_\_\_\_\_

**NOTES**

**Waste content:** identify and quantify components in highest proportion and greater than 10% of total; use proper chemical names

**Hazards:** check the applicable hazards and indicate the pH, if known

**Date and Quantity:** when ready for pick-up

**Lab location and contact info:** ensure lab contact name, contact email and contact phone number are provided

**Notes:** provide any additional information about hazards

SRS SAFETY-RISK Environmental Health & Research Safety In case of emergency call Campus Security 778-782-4500 SFU

Figure 4: Chemical Waste Label from Science Stores

## Transportation

When transporting nanoparticle solutions and/or materials, the contents must be labelled and placed in secondary containment that either snaps shut or screws on shut.

## Weighing Guideline for Dry Nanoparticle Powders

Since balances are not suitably accurate within a fume hood, weighing of dry nanoparticles is recommended to be done inside of a closed chamber that is lightly exhausted. This chamber is located within TASC 2 room 6076 (see Figure 5).

As with the work area requirements, all work must be done on top of a clean disposable absorbent liner. No absorbent liner is required on or underneath the mass balance, however, all surrounding areas and partially side walls must be protected (see Figure 5). Containers/vessels containing nanoparticles must only be opened and closed within the exhausted chamber. Opening/closing nanoparticle containers/vessels outside the chamber is strictly forbidden.

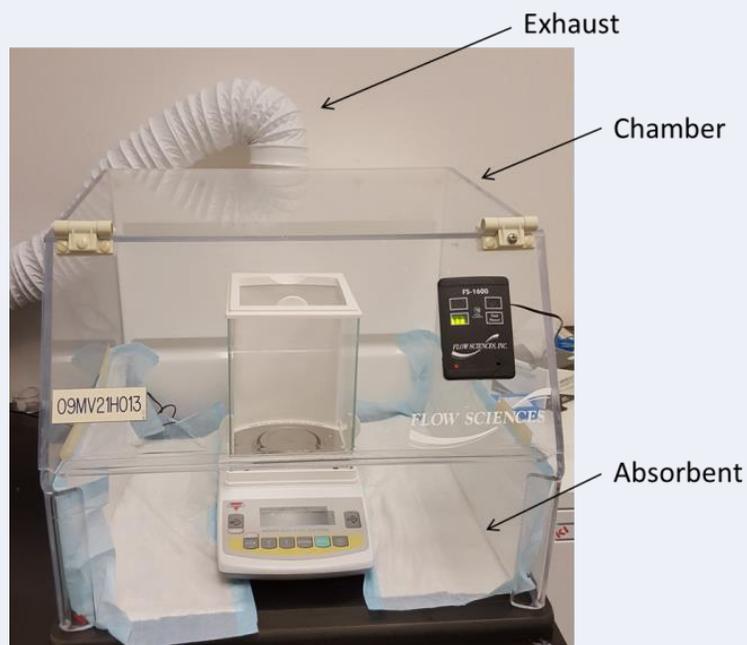


Figure 5: Closed Exhausted Chamber for Weighing Nanoparticles

## Spill Response

In the case of a spill of nanoparticle solution or dry powder, do not attempt to clean it up. Request assistance from 4D LABS staff immediately.