Employee Activities and Recommended Minimum Controls

State of the Nanomaterial	Employee Activity	Potential Exposure Source	Recommended Engineering Controls
Bound or fixed nanostructures (polymer matrix)	Mechanical grinding, alloying, etching, lithography, erosion, mechanical abrasion, grinding, sanding, drilling, heating, cooling.	Nanomaterials may be released during grinding, drilling, and sanding. Heating or cooling may damage the matrix, allowing the release of nanomaterial.	Local exhaust Ventilation Laboratory chemical hood (with HEPA filtered exhaust) HEPA-filtered exhausted enclosure (glovebox) Biological safety cabinet class II type A1, A2, vented via thimble connection or B1 or B2 Liquid suspension, liquid dispersion
Synthesis methods: chemical precipitation, chemical deposition, colloidal, electrodeposition crystallization, laser ablation (in liquid)	Pouring and mixing of liquid containing nanomaterials ■ Sonication ■ Spraying ■ Spray drying	Exposures may result from aerosolization of nanoparticles during sonication or spraying, equipment cleaning and maintenance, spills, or product recovery (dry powders).	Laboratory chemical hood (with HEPA filtered exhaust) HEPA-filtered exhausted enclosure (glovebox) Biological safety cabinet class II type A1, A2, vented via thimble connection, or B1 or B2
Dry dispersible nanomaterials and agglomerates	Collection of material (after synthesis), material transfers, weighing of dry powders, mixing of dry powders	Exposures may occur during any dry powder handling activity or product recovery	Laboratory chemical hood with HEPA filtered exhaust HEPA-filtered exhausted enclosure (glovebox) Biological safety cabinet class II, B1 or B2
Nanoaerosols and gas-phase synthesis (on the substrate)	Vapor deposition, vapor condensation, rapid solidification, aerosol techniques, gas-phase agglomeration, inert gas condensation (flame pyrolysis, high temperature evaporation), or spraying	Exposures may occur with direct leakage from the reactor, product recovery, processing and packaging of dry powder, equipment cleaning, and maintenance	Glovebox or other sealed enclosure with HEPA-filtered exhaust Appropriate equipment for monitoring toxic gases (e.g., CO)