https://nanocomposix.com/pages/depositing-monolayers-and-thin-films-of-nanoparticles#target

* PVP or silica coated particles with polar solves (water, ethanol)
  + Hydrophobic suspensions possible with dodecanethiol and polystyrene surfaces
* Drop-Casting
  + Spreading a nanoparticle dispersion over a substrate and allowing it to try under controlled conditions
  + For small substrates (~1 cm^2)
  + Best solvents are volatile, wet the substrate, and not susceptible to thin film instabilities (water is poor due to low vapor pressure and surface tension)
  + Alcohols can be used in place of water and organic solvents are also good choices
  + Difference in evaporation rates can lead to variations in thickness/internal structure
* Spin-Coating
  + Substrate is spun at high RPM and a volume of material with known particle concentration is introduced into the center and allowed to evaporate to yield a thin particle film
  + More uniform thickness than drop casting
  + Solvents other than water are favored
  + Procedure: <https://cdn.shopify.com/s/files/1/0257/8237/files/Spin_Coating_Protocol_for_PVP_Coated_Plasmonic_Nanoparticles.pdf?12146755928577464035>
* Dip-Coating
  + Slowly withdrawing a substrate from a nanoparticle dispersion causes particles to be drawn into the meniscus and deposited as the thin liquid layer dries
  + Yields very uniform, closed-packed, particle films
  + Many variables
* Spray-Coating
  + Uses nebulizers to generate a homogenous, aerosolized stream that applies evenly onto the target substrate
  + Aerosolized droplets deposit onto the substrate in an even and homogenous manner
  + Volatile solvents preferred
  + Can engineer the deposition with tunable parameters
* Langmuir-Blodgett Deposition
  + Dispersion of particles is evaporated onto an immiscible liquid substrate in the LB trough
  + High level control over deposition since formation of nanoparticle filmed is independent from transfer of film to substrate
  + Particle layer can be compressed to obtain ~100 cm^2 areas
  + Uniform film formation across entire substrate
* Substrate/Particle Surface Functionalization
  + Functionalizing substrate and particles with complimentary coatings to allow chemical or electrostatic attachment of particles
  + Two general methods
    - Using a short chain linking molecule with two functions groups, one which binds to substrate and one which attaches to the particles
    - Related technique uses charge interactions between molecules bound to the surface and oppositely charged nanoparticles
  + Deposits a monolayer at a time and layers can be built up
  + Requires surface modification of the substrate

https://en.wikipedia.org/wiki/Nanoparticle\_deposition

* Langmuir-Blodgett
  + Motorized barriers control the packing density of the particles
* Dip and spin coating
  + Creating high density monolayers is difficult because packing density cannot be controlled
  + Requires a large volume of nanoparticle suspension
* Solvent evaporations, doctor blade, chemical vapor deposition, and transfer printing

https://pubs-acs-org.ezp-prod1.hul.harvard.edu/doi/suppl/10.1021/acs.nanolett.8b00273/suppl\_file/nl8b00273\_si\_001.pdf

* SiO2 nanospheres from nanoComposix
* Dispersed in water, with a concentration of 5-10 mg/mL
* 300 nm SiO2/Si substrates cleaned using sonification in acetone and IPA, and oxygen plasma, and then the nanoparticles were spin-coated
* Samples were baked at 170 C for 20 minutes on a hotplate to remove residual water
* Close packed monolayer regions from a few microns to a few tens of microns
* Spherical particles with controlled, minimum spacing

<https://journals-aps-org.ezp-prod1.hul.harvard.edu/prx/pdf/10.1103/PhysRevX.2.041018>

* Silica-nanoparticle colloidal dispersions (Nissan Chemical America Corp) diluted to various concentrations of 0.5-3.0 wt % by deionized water
* Sonicated for 30 min in a water bath to break agglomerations
* Spin coated on a 300 nm thick oxide layer at 4000 rpm for 30 sec
* Density of nanoparticles ranger from 2 to 258 micro meter ^ -2
* Dried on a hotplate at 150 C for 2 hours