

Supplement

Fabrication and mechanical properties of large-scale freestanding nanoparticle membranes**

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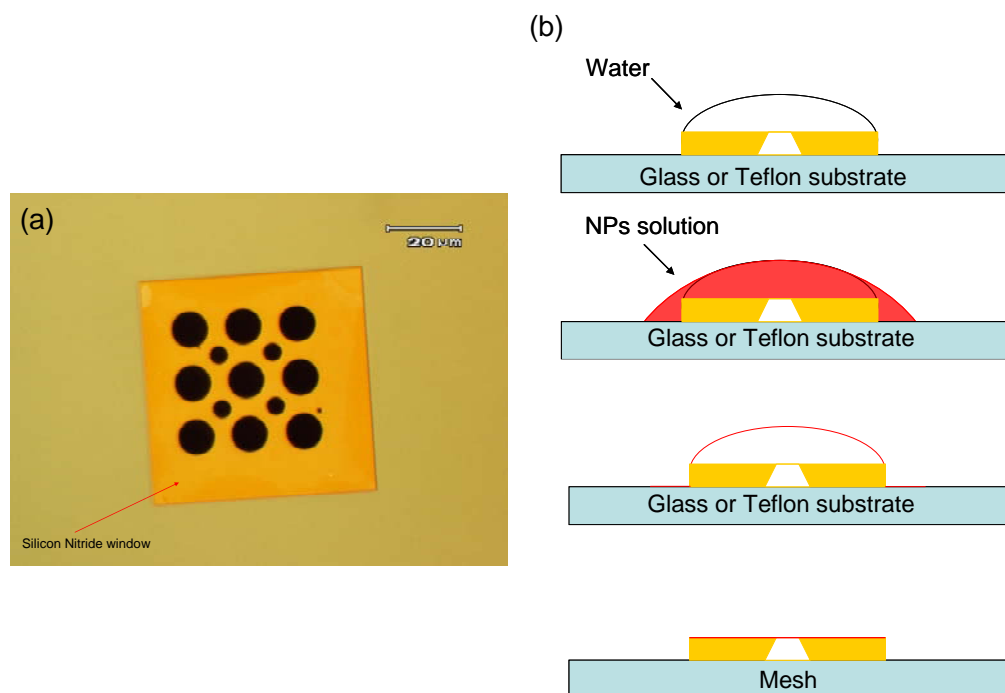


Figure S1. (a). Optical image of one of the silicone nitride covered silicon chips prior to nanoparticle deposition. The lighter, square area is the window region, consisting of just silicon nitride (~100nm thin). Holes etched into the window appear dark. (b) Schematic of the membrane preparation process (top to bottom).

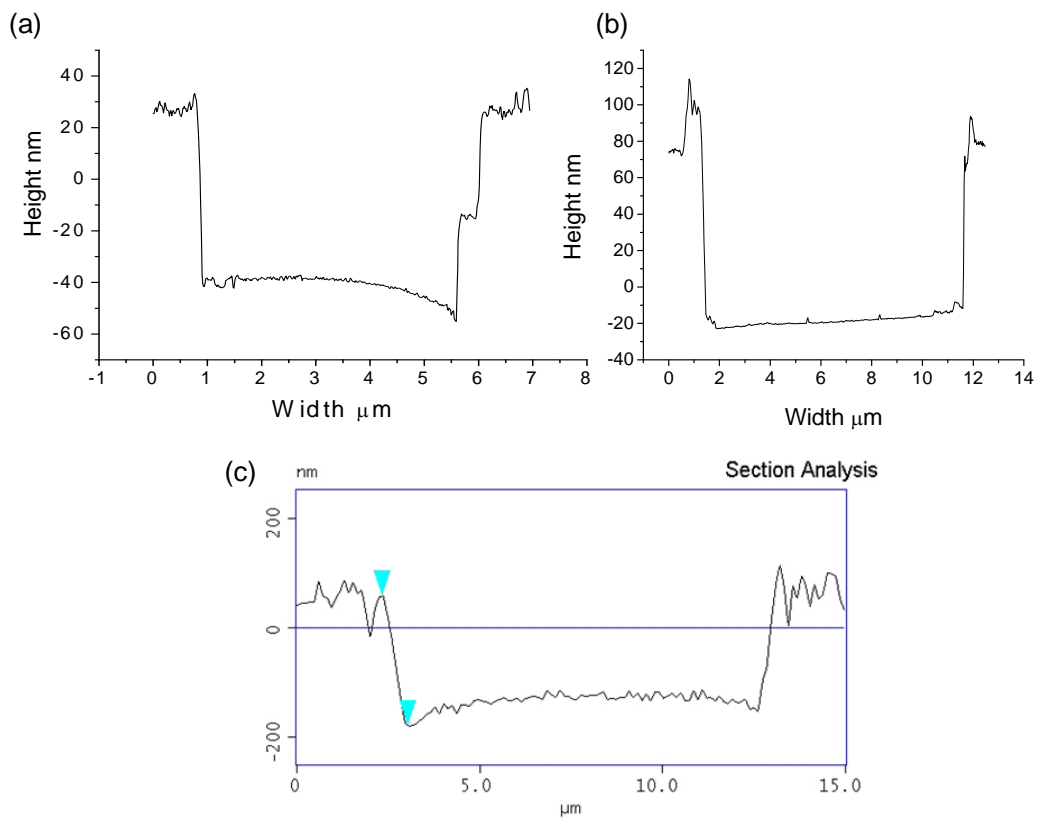


Figure S2. AFM Height profiles of Au (a), Fe/Fe₃O₄ (b) and CoO (c) nanoparticle membranes (corresponding to sections through Figures. 1a-c in the main text). The step in the profile in (a) at 6μm is an artifact due to the AFM tip shape as it came into contact with the rim of the hole. All membranes recede into the holes by an amount roughly equal to the silicon nitride thickness left after reactive ion etching, which differs due to different etching conditions.

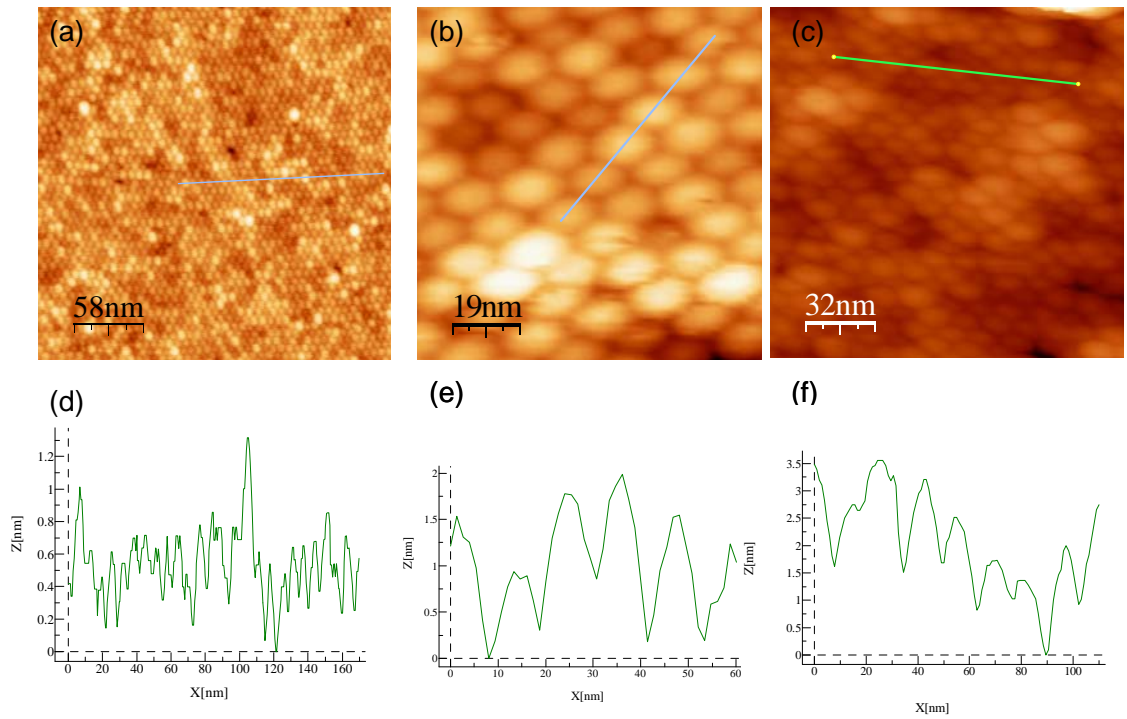


Figure S3. (a)-(c) AFM height images of Au (a), Fe/Fe₃O₄ (b) and CoO (c) membranes inside the hole region. (d)-(e) Line scans of the respective AFM images. The apparent size difference between nanoparticles seen in the height images, where brighter (higher located) particles seem larger than darker (deeper) particles, is due to the convolution of the actual topography with the finite size of the AFM tips. This is less of an issue for atomic imaging but becomes noticeable for objects such as nanoparticles with dimensions that are significant fractions of the tip radius.

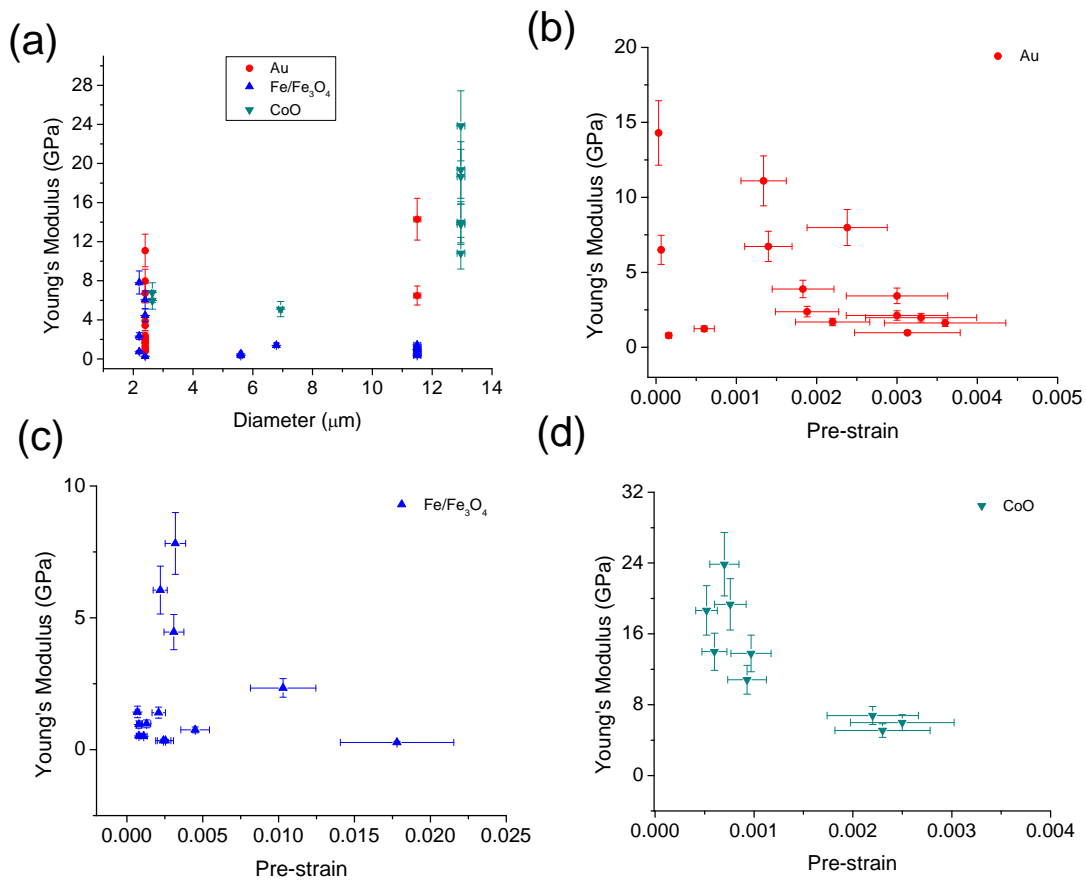


Figure S4. (a) Young's moduli as a function of membrane diameter. (b) Young's moduli versus pre-strain of Au membranes. (c) Young's moduli versus pre-strain of Fe/Fe₃O₄ membranes. (d) Young's moduli versus pre-strain of CoO membranes.

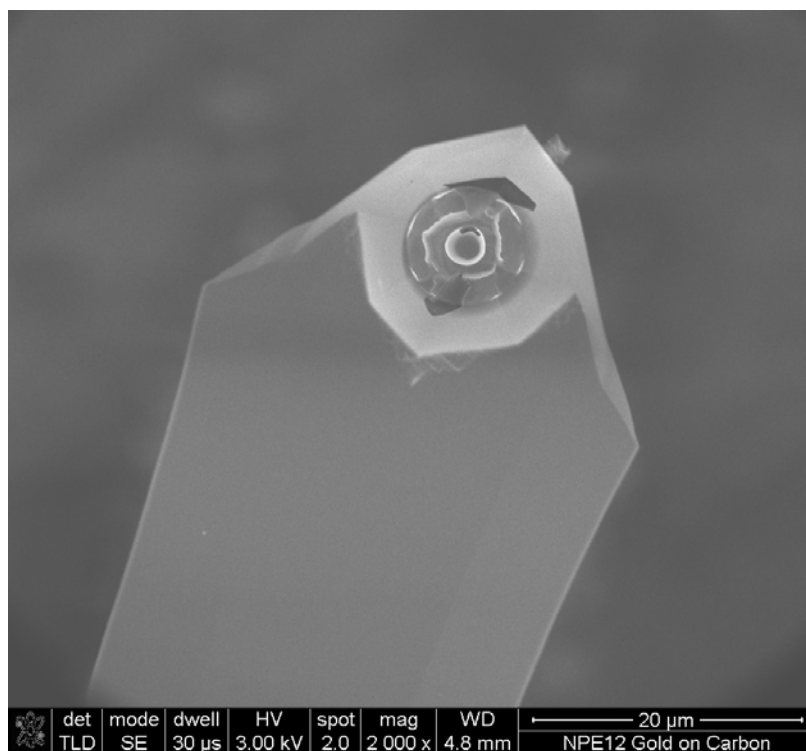


Figure S5. SEM image of the plateau AFM tip used in the indentation measurement of large CoO membranes.