Conductive Nanostructures Assembled from Gold Nanoparticles at Air / Water Interface

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Construction of controlled, organized nanostructure assemblies has been among the most challenging aspects of nanotechnology research and development. While "top-down" lithography techniques have dominated, new "bottom-up" self-assembly methods have garnered increasing interest as viable alternatives[1, 2].
We describe the construction of nanostructures of hydrophobically-capped gold nanoparticles (Au NPs) soluble in unsaturated fatty acid assemblies, created within Langmuir monolayers of long chain alcohols[3] (fig. 1A).

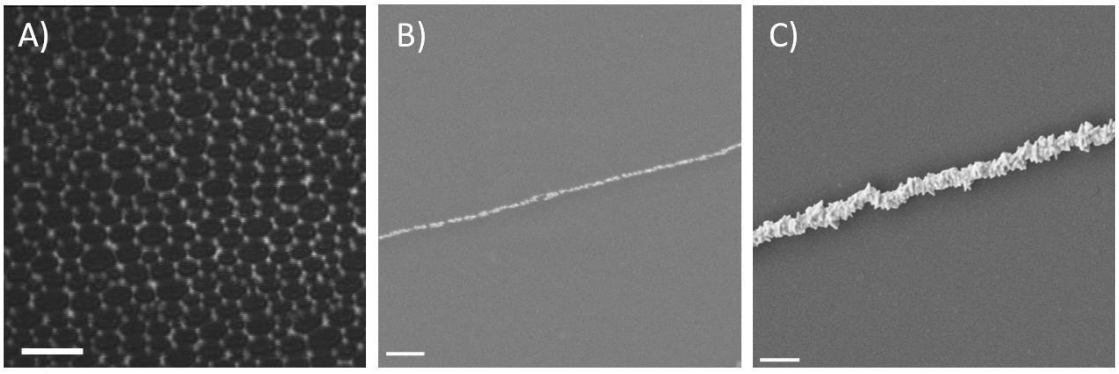

Fig 1. (A) BAM image of Au NPs arrangement between Myristyl Alcohol domains at the air/water interface recorded at surface pressure of 12.5 mN/m. Scale bar: 40 µm; (B) SEM image corresponding to a fragment of the Au nanowire network transferred from the air/water. Scale bar: 200 nm; (C) SEM image of a fragment of the Au nanowire network following annealing and gold seeding. 500 nm.

Those structures are created at the air/water interface through the compression of the above materials to a target surface pressure of 12.5 mN/m. After the structures are created at the air/water interface a Langmuir-Schaefer technique is being used in order to transfer those structures to a solid surface (fig. 1B). After the removal of the Au NPs capping agent through annealing at 350 °C the Au NPs on the solid surface are used as catalysts for a selective gold reduction (seeding process) on the surface using hydroquinone as the reducing agent (fig. 1C). After the seeding process we were able to get continuous structures which exhibits conductivity and transparent properties.

[1] R. Volinsky, R. Jelinek, *Angewandte Chemie (International Ed. In English)* **2009**, *48*, 4540-2.
[2] N. Markovich, R. Volinsky, R. Jelinek, *Journal Of the American Chemical Society* **2009**, *131*, 2430-1.
[3] A. Morag, L. Philosof-mazor, R. Volinsky, E. Mentovich, S. Richter, R. Jelinek, *Submitted* **n.d.**