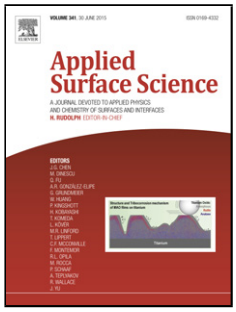

Title: AC Electric field Induced Dielectrophoretic Assembly Behaviour of Gold Nanoparticles in a Wide Frequency Range

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PII: S0169-4332(16)30296-3
DOI: http://dx.doi.org/doi:10.1016/j.apsusc.2016.02.118
Reference: APSUSC 32636

To appear in: *APSUSC*

Received date: 24-11-2015
Revised date: 30-1-2016
Accepted date: 14-2-2016

Please cite this article as: W. Liu, C. Wang, H. Ding, J. Shao, Y. Ding, AC Electric field Induced Dielectrophoretic Assembly Behaviour of Gold Nanoparticles in a Wide Frequency Range, *Applied Surface Science* (2016), http://dx.doi.org/10.1016/j.apsusc.2016.02.118

Highlights

1. As field frequency varies, grown features of DEP assembly structures of gold colloidal suspension ranging from low-frequency (10kHz) non-bridged gap to high-frequency (1MHz) single gold nanoparticle-made nanowires bridging the electrodes are demonstrated experimentally.
2. The novel channel-like structure formed at low field frequency tends to further miniaturize the size of microelectrode gap fabricated by standard micromachining process, and may find useful application in biochemical sensing.
3. In stark contrast, PCF of high surface-to-volume ratio formed at high field frequencies makes it promising for creation of on-chip in situ bioelectronic circuits and wet circuits from colloidal suspensions.
4. As for DEP device embedded with multiple floating electrodes, high frequency such as 1MHz produces a particular conductive path of nanoparticle chains which successively connects all the conductive islands and driving electrode pair.
5. A theoretical framework taking into account field-induced double-layer polarization at both the particle/electrolyte and electrode/electrolyte interface is developed to correlate our experimental observations with ICEK.