

**TITLE**

**Fabrication and  
characterization  
of Pd nanocluster  
devices**

**A. I. Ayesh, N. Qamhie, S. T.  
Mahmoud and Z. A. Karam**

United Arab Emirates University, UAE

In this work, we report on the fabrication and characterization of palladium (Pd) nanocluster devices. Pd nanoclusters were synthesized inside a dc magnetron sputtering source, where plasma vaporizes the target's material, and nanoclusters are formed by inert gas condensation. The size distribution of the produced nanoclusters was investigated using a quadrupole mass filter, and was found to depend on the source conditions such as the inert gas flow rate. In the current study, Pd nanoclusters with an average size of 6.7 nm were used (produced using an inert gas flow rate of 90 sccm).

To create the device, nanoclusters were self-assembled on a SiO<sub>2</sub>/Si substrate that contains a pair of pre-formed Au/NiCr electrical electrodes defined by optical lithography. The electrical current between the electrodes was monitored during nanocluster deposition. A sharp increase in the current is an indication of the formation of a continuous network of clusters, thus, nanocluster deposition is abruptly stopped. The electronic transport of the devices is investigated by systematic current-voltage ( $I(V)$ ) measurements as a function of temperature. It is demonstrated through fitting the conductance-temperature profile into a conductance model that electrical conduction in the device is dominated by tunneling.

**Biography**

A. Ayesh has completed his Ph.D from University of Canterbury at New Zealand. He is an assistant professor and the head of the Nanocluster Devices group at the United Arab Emirates University – UAE. He has published more than 27 papers in reputed journals and conferences.