

# Production Of Size-selected Copper Nanoclusters For Petroleum Refinery Applications

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## Abstract

Atomic nanoclusters exhibit large surface to volume ratio which enhances their ability to interact with external materials, thus, they can be utilized efficiently for catalysts and gas sensing applications. Copper (Cu) nanoclusters are a promising system for gas sensing applications, mainly because of its sensitivity and selectivity for H<sub>2</sub>S [1,2]. In this work, Cu nanoclusters were synthesized using the dc magnetron sputtering and gas-condensation technique [3,4]. The dependence of nanoclusters' size on various source parameters such as the inert gas flow rate, and aggregation length has been investigated in detail. The results show that as the inert gas flow rate increases, the nanocluster size decreases. These results could be understood as a result of nanocluster production by three-body collision mechanism. This work demonstrates the ability of tuning the nanoclusters' size and yield by a proper optimization of the source operation conditions.

Keywords: Cu nanoclusters, sputtering, nanocluster size selection, inert gas condensation, nanocluster formation mechanism

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