World Academy of Science, Engineering and Technology
International Journal of Mathematical and Computational Sciences
Vol:14, No:12, 2020

# Metallic and Semiconductor Thin Film and Nanoparticles for Novel Applications

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**Abstract :** The process of assembling metal nanoparticles at the interface of two liquids has received a great interest over the past few years due to a wide range of important applications and their unusual properties compared to bulk materials. We present a low cost, simple and cheap synthesis of metal nanoparticles, core/shell structures and semiconductors followed by assembly of these particles between immiscible liquids. The aim of this talk is divided to three parts: firstly, to describe the achievement of a closed loop recycling for producing cadmium sulphide as powders and/or nanostructured thin films for solar cells or other optoelectronic devices applications by using a different chain length of commercially available secondary amines of dithiocarbamato complexes. The approach can be extended to other metal sulphides such as those of Zn, Pb, Cu, or Fe and many transition metals and oxides. Secondly, to synthesis significantly cheaper magnetic particles suited for the mass market. Ni/NiO nanoparticles with ferromagnetic properties at room temperature were among the smallest and strongest magnets (5 nm) were made in solution. The applications of this work can be applied to produce viable storage devices and the other possibility is to disperse these nanocrystals in solution and use it to make ferro-fluids which have a number of mature applications. The third part is about preparing and assembling of submicron silver, cobalt and nickel particles by using polyol methods and liquid/liquid interface, respectively. Noble metal like gold, copper and silver are suitable for plasmonic thin film solar cells because of their low resistivity and strong interactions with visible light waves. Silver is the best choice for solar cell application since it has low absorption losses and high radiative efficiency compared to gold and copper. Assembled cobalt and nickel as films are promising for spintronic, magnetic and magneto-electronic and biomedics.

**Keywords :** assembling nanoparticles, liquid/liquid interface, thin film, core/shell, solar cells, recording media
**Conference Title :** ICSRD 2020 : International Conference on Scientific Research and Development
**Conference Location :** Chicago, United States
**Conference Dates :** December 12-13, 2020