

Review On Metal Nanoparticles Embedded in Molybdenum Disulfide Nanosheets: Synthesis and Properties

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ABSTRACT

Study of transition metal dichalcogenides (TMDCs) has become very crucial due to their wide range of applications in various fields such as sensors, supercapacitors, biological imaging, etc. Molybdenum Disulfide (MoS_2) nanosheet is a 2D TMDCs semiconductor, which is considered to be an ideal substrate as it gets easily hybridized in presence of functional group and results in formation of MoS_2 -based nanocomposites. Amongst the different types of MoS_2 -based nanocomposites, Metal- MoS_2 nanocomposite are unique due to their unusual and extraordinary properties. In this review, we will be focussing on the various techniques of synthesis and properties displayed by Ag- MoS_2 , Au- MoS_2 , Pd- MoS_2 and Pt- MoS_2 nanocomposites.

Keywords: Molybdenum Disulfide, Metal-Molybdenum Disulfide, Surface plasmon resonance (SPR).

1. INTRODUCTION:

The study of Molybdenum Disulfide (MoS_2) plays an important role due to their wide range of applications in lubricants, catalysis, sensors, supercapacitors, etc, [1-8]. MoS_2 nanosheets are 2D semiconductor which possess great chemical and thermal stability, large active surface area, high reactivity, and exhibit increased adsorption capacity [9-11]. Multi-layered MoS_2 nanosheets have indirect bandgap whereas monolayered MoS_2 nanosheets possess direct bandgap structure due to hybridization between the d orbitals of Mo atoms and p_z orbitals of S [12]. Various methods such as spin coating, metal organic chemical vapour deposition, sputtering technique, etc. are used for the synthesis of the MoS_2 nanosheets [13-20]. Deposition of metal nanoparticles such as silver NPs, gold NPs, palladium NPs and platinum NPs on the surface of the MoS_2 nanosheets enhances its properties due to the surface plasmon resonance (SPR) effect displayed by these NPs [21,22].

2. SYNTHESIS OF METAL-MOLYBDENUM DISULFIDE NANOCOMPOSITE