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The formation of Colloidal 2D/3D MoS₂ Nanostructures in Organic Liquid Environment¹ ENGIN DURGUN, H. SENER SEN, TUGBA OZTAS, BULEND ORTAC, Bilkent University - UNAM — 2D MoS₂ nanosheets (2D MoS₂ NS) and fullerene-like MoS₂ nanostructures (3D MoS₂ NS) with varying sizes are synthesized by nanosecond laser ablation of hexagonal crystalline 2H-MoS₂ powder in methanol. Structural, chemical, and optical properties of MoS₂ NS are characterized by optical microscopy, SEM, TEM, XRD, Raman and UV/VIS/NIR absorption spectroscopy techniques. Results of structural analysis show that the obtained MoS₂ NS mainly present layered morphology from micron to nanometer surface area. Detailed analysis of the product also proves the existence of inorganic polyhedral fullerene-like 3D MoS₂ NS generated by pulsed laser ablation in methanol. The possible factors which may lead to formation of both 2D and 3D MoS₂ NS in methanol are examined by ab initio calculations and shown that it is correlated with vacancy formation. The hexagonal crystalline structure of MoS₂ NS was determined by XRD analysis. The colloidal MoS₂ NS solution presents broadband absorption edge tailoring from UV region to NIR region. Investigations of MoS₂ NS show that the one step physical process of pulsed laser ablation-bulk MoS₂ powder interaction in organic solution opens doors to the formation of “two scales” micron- and nanometer-sized layered and fullerene-like morphology MoS₂ structures.

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