**Langmuir-Blodgett films from liquid phase exfoliated 2D materials: surface modification and optoelectronic properties**

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Liquid phase exfoliation is an important production technique to obtaining a high yield of two-dimensional nanosheets in solution. It can be applied to numerous layered materials and satisfies practical applications. Langmuir-Blodgett deposition is a simple and versatile method based on self-organization of nanostructures that brings large surfaces of thin films on the substrate of choice. Although, Langmuir-Blodgett self-assembly (LBSA) of 2D materials in solution allows facile fabrication of highly transparent graphene films, the high density of defects that causes high sheet resistance of these films is unavoidable. Identifying the type of defect of these films and understanding how they can be manipulated is crucial for development of new strategies to adapt their electrical properties to the requirements of the optoelectronic industry. In this talk, the structure and optoelectronic properties of LBSA graphene films, the change and subsequent enhancement of their sheet conductivity with surface modification/functionalization by chemical doping, annealing, photochemical oxidation, and plasma exposure will be summarized [1-3]. Surface modification of these films results in a multifold reduction in sheet resistance of the films without changing their high transmittance. Edges are the dominant type of defect of these films and play a crucial role in defect patching and enhancing of electrical properties of modified LBSA graphene films. For materials beyond graphene, the properties and the encapsulation capability of LBSA films of h-BN for high-quality CVD graphene, ideal for transparent electronics but highly degradable in extreme environments such as photochemical oxidation, will be discussed.

[1] A. Matković, et al., 2D Mater. 3, 015002 (2016)

[2] T. Tomašević-Ilić, J. Pešić, I. Milošević, J. Vujin, A. Matković, M. Spasenović, R. Gajić, Opt. Quant. Electron. 48, 319 (2016)

[3] T. Tomašević-Ilić, Đ. Jovanović, I. Popov, R. Fandan, J. Pedrós, M. Spasenović, R. Gajić, Appl. Surf. Sci. 458, 446–453 (2018)