
Optical writing of electric states in 2D/ferroelectric -photovoltaic structures.

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Because of single-atom layer structure, the two dimensional ('2D') materials possess unique electronic properties² which can prone to atomic scale devices control allowing to explore condensed matter physics on the atomic scale [1]. However, establishing a robust control over basic physical properties of 2D structures remains an important challenge. This PhD project is addressing this issue by focusing on the development of electrical and more

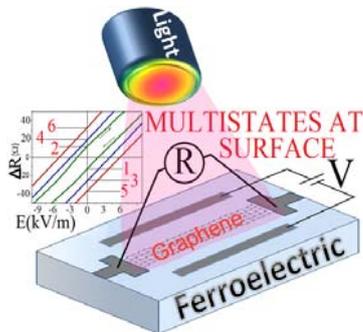


Figure 1: Schematic illustration of the electrooptical control of low dimensional structure using ferroelectric substrate.

importantly optical control in the 2D structures via their combination with photoferroelectric materials. While the electrical control has already been demonstrated in such heterostructures for the both bulk [2] and surface [3] configurations the optical one presents a promising research direction based on the recently discovered photopolarization effect [4,5]. The last effect involving remanent photopolarization can result in technologically

important optical writing possibility never studied before. The established electrooptical functionality of the type shown in Fig.1 will further be tested to explore opto-electro-static and spin-orbit coupling in the specially designed nanostructures. The task of PhD student will be to prepare 2D structures and 2D heterostructures [5] over the multifunctional ferroelectric and photovoltaic substrates using nanofabrication facilities in the cleanroom environment of the Institute. The electrical, optical and magnetic measurements will be then performed by the candidate at our laboratory according to the objectives. The candidate should have an experience in research lab work, good skills in spoken and written English and sufficient knowledge of material science.

[1] K. S. Novoselov, et al. Science, 353, 9439 (2016).

[2] G. -X. Zheng, et al., Phys. Rev. Lett. 105, 166602 (2010).

[3] V. Iurchuk, H. Majjad, F. Chevrier, D. Kundys, B. Leconte, B. Doudin, B. Kundys, Appl. Phys. Lett. 107, 182901 (2015).

[4] A. S. Makhort, F. Chevrier, D. Kundys, B. Doudin, B. Kundys, Phys. Rev. Materials 2, 012401(R)(2018).

[5] V. Iurchuk, et al. Phys. Rev. Lett. 117, 107403 (2016).