Electrooptical control of 2D/ferroelectric - photovoltaic structures.

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Stimulated by a pioneering graphene, many other semiconductors of few atoms thickness have been recently discovered making the two dimensional ('2D') materials a major research field, 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 optical control in the 2D structures via their combination with ferroelectric 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]. The established electrooptical functionality of the type shown in Fig.1 will further be tested to control spin transfer mechanisms and to explore electrostatic 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.

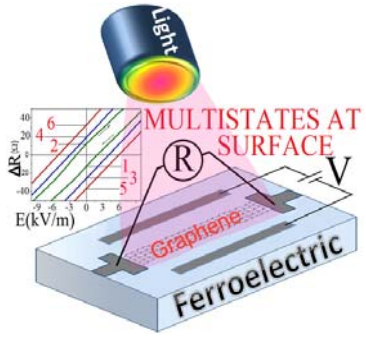

Figure 1: Schematic illustration of the electrooptical control of low dimensional structure using ferroelectric substrate.

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[5] F. Godel, L.D.N. Mouafo, G. Froehlicher, B. Doudin, S. Berciaud, Y. Henry, J.-F. Dayen, D. Halley, Advanced Materials, Volume 29, Issue 3, 1604837 (2017).