A. SENKIĆ – TIME-RESOLVED KERR ROTATION IN TRANSITION METAL DICHALCOGENIDES (TMDS)

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ABSTRACT

After the discovery of atomically thin 2D materials, numerous new possibilities and potential applications became available. Most materials in the transition metal dichalcogenides (TMDs) family of materials are semiconductors with sizable bandgap in visible or infrared part of electromagnetic spectrum (1-2 eV) and, therefore, can be optically excited. The excellent electrical and optical features including the high mobility, immense gate modulation of current as well as strong photoluminescence could offer their opportunity in nanoelectronics, optoelectronics and energy harvesting applications.

Due to the lack of symmetry in TMDs monolayer, another degree of freedom can be used to storage and transfer information – valley degree of freedom. Large spin-orbit coupling in combination with circular dichroism allows a spin- and valley-selective excitation of excitonic states in TMDs. As a result, valley can be considered as a new degree of freedom holing promising application potential in novel valleytronic devices. To reveal the elementary mechanisms behind the generation and decay of the valley polarization, a number of time-resolved experiments were performed. Here, I present one specific ultrafast spectroscopic technique: time-resolved Kerr spectroscopy (TRKR). In this seminar, I will explain principles of this technique and present results from two research groups [1, 2] providing us an insight into the complex dynamics of valley excitonic states, which will be critical for valleytronic applications of TMDs.

[1] J. Huang et al: “Temporal and spatial valley dynamics in twodimensional semiconductors probes via Kerr rotation”, PhyRevB **95**, 075428, 2017;

[2] P. Dey et al: “Gate-controlled spin-valley locking of resident carriers in WSe2 monolayers”, PRL **119**, 137401, 2017.