Rashba Angle Enhancement in Graphene Proximitized by 1T-TaS₂ Monolayers

Martin Gmitra^{1,2, a)}, Marko Milivojević^{3,4}, K. Szałowski⁵, and D. Legut^{6,7}

¹Institute of Experimental Physics, Slovak Academy of Sciences, Watsonova 47, 04001 Košice, Slovakia

²Institute of Physics, Pavol Jozef Šafarik University in Košice, Park Angelinum 9, 04001 Košice, Slovakia

³Institute of Informatics, Slovak Academy of Sciences, 84507 Bratislava, Slovakia

⁴Faculty of Physics, University of Belgrade, 11001 Belgrade, Serbia

⁵University of Łódź, Faculty of Physics and Applied Informatics, Department of Solid State Physics, PL90-236 Łódź,

Poland

⁶IT4Innovations, VSB-Technical University of Ostrava, 17. listopadu 2172/15, 708 00 Ostrava, Czech Republic ⁷Department of Condensed Matter Physics, Faculty of Mathematics and Physics, Charles University, Ke Karlovu 3,

121 16 Prague 2, Czech Republic

^{a)} Corresponding author: gmitra@saske.sk

Abstract. Incorporating graphene into the van der Waals heterostructures provides an unprecedented control of its Dirac electronic states via proximity effects. In the talk we discuss proximity induced spin-orbit coupling effects in graphene / 1T-TaS₂ heterostructure. We found that the charge density wave phase in the 1T-TaS₂ monolayer significantly augments the Rashba angle in the graphene [1]. Furthermore, we demonstrate that applying a transverse electric field can further boost the Rashba spin-orbit coupling parameters. Notably, the unique sandwich structure comprising 1T-TaS₂ /graphene/1T-TaS₂ can push the Rashba angle to its $\pi/2$ limit, a critical threshold for charge-to-spin conversion utilizing the collinear Rashba-Edelstein effect.

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[1] K. Szałowski, et al., 2D Materials 10, 025013 (2023).