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Spintronics with Graphene and van der Waals heterostructures SAROJ DASH, M.VENKATA KAMALAKAR, ANDR DANKERT, Chalmers University of Technology, QUANTUM DEVICE PHYSICS LABORATORY TEAM — Two-dimensional (2D) atomic crystals provide a large class of materials proposed to be important for nanoelectronics and spintronic. Here we present two important advancements in graphene spintronics by employing 2D materials and heterostructures. Graphene is considered to be an ideal material for spin transport due to the high mobility and long spin lifetime of the carriers. We realized spin transport over a long distance of 16 m and spin lifetimes up to 1.2 ns in large area CVD graphene on SiO_2/Si substrate at room temperature [1]. Subsequently, using the h-BN tunnel barrier/graphene van der Waals heterostructure; we observe an enhancement in the tunnel spin polarization [2], and a negative spin signal for thicker h-BN barriers. These findings open a platform for exploring novel spin functionalities in 2D crystal heterostructures and understanding the basic science that control their behavior. [1] M. V. Kamalakar et al., Long Distance Spin Communication in Chemical Vapor Deposited Graphene, Nature Communications 6, 6766 (2015). [2] M. V. Kamalakar et al., Enhanced Tunnel Spin Injection into Graphene using Hexagonal Boron Nitride; Scientific Reports 4, 61446 (2014).

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