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Revealing the atomic, electronic and optical properties of two-dimensional Van der Waals heterostructures LEONARDO BASILE, Escuela Politecnica Nacional, Quito, Ecuador and Oak Ridge National Laboratory, JUAN-CARLOS IDROBO, Oak Ridge National Laboratory — In this talk, we will present a study of the optical absorption of graphene on hexagonal boron nitride (h-BN) using a combination of first-principles calculations and aberration-corrected scanning transmission electron microscopy (STEM). We will show the emergence of a novel interesting electron-optical phenomenon present on 2D heterostructures. Specifically, the absorption spectrum of a graphene layer on a h-BN layer under illumination with a dichroic signal was calculated. The results indicate that the rotation angle between graphene and h-BN layers can be used as a tuning variable to achieve valley polarization, that is, to localize electrons to specific momentum valleys. We will discuss how the emergent field of valleytronics, in 2D heterostructures, can be accessed at the atomic scale using a monochromated aberration-corrected STEM and novel vortex electron probes carrying orbital angular momentum. This research was supported by the National Secretariat of Higher Education, Science, Technology and Innovation of Ecuador (SENESCYT) (LB), and the Center for Nanophase Materials Sciences (CNMS), which is sponsored at Oak Ridge National Laboratory by the Scientific User Facilities Division, Office of Basic Energy Sciences, U.S. Department of Energy (JCI).

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