

Abstract Submitted
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All-optical, contactless real-space mapping of valley polarization in 2D materials¹ F. HIPOLITO, VITOR M. PEREIRA, Natl Univ of Singapore — Valley Polarization (VP), an induced imbalance in the population of a multi-valley electronic system, allows for Second Harmonic Generation (SHG) even in centrosymmetric crystals such as graphene. We study the quadratic response of a generic two-band electronic system on a honeycomb lattice to electromagnetic radiation and analyze the interplay between the intensity of SHG by valley polarization and that due to an intrinsic absence of inversion symmetry. Whereas in pristine monolayer graphene SHG could be a direct indication of VP, in a multilayer heterostructure, or a system such as MoS₂ or BN, second-harmonic will be present either intrinsically or spuriously from the interfaces. By characterizing the SHG response as a function of polarization state, temperature, electron density, and degree of VP, we demonstrate the possibility of identifying (and hence disentangling) the intrinsic and valley contributions to the SHG independently. A specific experimental setup is proposed to obtain direct quantitative information about the degree of VP and allow its remote mapping. This approach could prove useful for direct, contactless, real-space monitoring of valley injection and other applications of valley transport and valleytronics.

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