Continuum Model of the Twisted Bilayer

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Abstract

The electronic structure of the twisted bilayer was considered [1] in the context of a continuum description of the two layers, coupled by a spatially modulated hopping. The model's predictions were subsequently confirmed by experiments [2, 3], including a scanning tunneling spectroscopy finding of two low energy Van-Hove peaks in the density of states [4], and by band structure calculations[5, 6]. We discuss the extension of the model in several directions: the two families of commensurate structures discovered by Mele [7], will be characterized by elementary geometrical arguments; it will be shown that it is possible to calculate analytically all Fourier components of the hopping amplitudes for any kind of commensurate structure with large period. This allows calculations with the continuum model to be extended beyond the perturbative regime in the interlayer coupling, to address the electronic structure and local density of states in the very small angle limit [8]. A physically transparent explanation of carrier localization in AA stacked regions emerges [9], which gives a good account of the "magic angles" (values of the twist angle with zero fermi velocity) found by Bistritzer and MacDonald [10].

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