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Titel des Beitrags: What are the possible moiré patterns of graphene on hexagonally packed surfaces? Universal solution for hexagonal coincidence lattices, derived by a geometric construction

Abstract: We present a systematic investigation of two coinciding lattices and their spatial beating frequencies that lead to the formation of moiré patterns. A mathematical model was developed and applied for the case of a hexagonally arranged adsorbate on a hexagonal support lattice. In particular, it describes the moiré patterns observed for graphene grown on a hexagonally arranged transition metal surface, a system that serves as one of the promising synthesis routes for the formation of this highly wanted material. The presented model uses a geometric construction that derives analytic expressions for first and higher order beating frequencies occurring for arbitrarily oriented graphene on the underlying substrate lattice. By solving the corresponding equations, we predict the size and orientation of the resulting moiré pattern. Adding the constraints for commensurability delivers further solvable analytic equations that predict whether or not first or higher order commensurable phases occur. We explicitly treat the case for first, second and third order commensurable phases. The universality of our approach is tested by comparing our data with moiré patterns that are experimentally observed for graphene on Ir(111) and on Pt(111). Our analysis can be applied for graphene, hexagonal boron nitride (h-BN), or other sp²-networks grown on any hexagonally packed support surface predicting the
size, orientation and properties of the resulting moiré patterns. In particular, we can determine which commensurate phases are expected for these systems. The derived information can be used to critically discuss the moiré phases reported in the literature.