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The zero-voltage conductance of nano-graphenes: Simple rules and

Zero-dimensional graphenes, or nano-graphenes (NGs), are fragments of graphene with a finite number of hexagons, and form a subset of the polycyclic aromatic hydrocarbons. We develop a simple theory for ballistic electron transport through NGs which combines electronic structure theory of graphene, intuitive methods for calculation of molecular conductance, and chemical concepts such as Kekulé structures. This theory enables analysis of relations between structure and conductance. General formulas and rules for zero-voltage conductance as a function of contact positions are derived. These require at most simple paper and pencil calculations in applications to systems containing tens of carbon atoms.