

Electron on a lattice with Rashba and Dresselhaus spin-orbit coupling

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In this work, we study the tight-binding model on a square lattice incorporating spin-orbit interactions, with a focus on the microscopic derivation of the Rashba and Dresselhaus Hamiltonians. We analyze energy spectra of these spin-orbit coupled systems, providing explicit diagonalization of both Hamiltonians. Furthermore, we construct and demonstrate a unitary transformation that connects the Rashba and Dresselhaus models.