Electronic Properties in a Hierarchical Multilayer Structure

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(Received: 1999-12-6; Revised: 2000-3-15)

Abstract: We investigate electronic properties of a hierarchical multilayer structure consisting of stacking of barriers and wells. The structure is formed in a sequence of generations, each of which is constructed with the same pattern but with the previous generation as the basic building blocks. We calculate the transmission spectrum which shows the multifractal behavior for systems with large generation index. From the analysis of the average resistivity and the multifractal structure of the wavefunctions, we show that there exist different types of states exhibiting extended, localized and intermediate characteristics. The degree of localization is sensitive to the variation of the structural parameters. Suggestion of the possible experimental realization is discussed.

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