On the Transformation of the Normal-State Band Spectrum of Bi-based HTSC with Increasing Doping Level and Number of CuO_2 Layers

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We present the results of the systematic quantitative analysis of the thermopower behavior in doped Bi-based high-temperature superconductors in the framework of a phenomenological narrow-band model. On the basis of this model we have determined the parameters characterizing the energy spectrum structure and properties of the charge-carrier system in the normal state in cases of different numbers of copper-oxygen layers and varied type and level of non-isovalent substitutions for different lattice positions. Both the common tendencies in variations of these parameters with changing sample composition and peculiarities of a specific doping effect were revealed. We have analyzed the band spectrum transformation with increasing number of CuO_2 layers for the optimally doped compositions, as well as under doping influence in both the underdoped and overdoped regimes. Possible mechanisms of modification of the band responsible for the conduction process are proposed and their relative role in cases of different ways of varying sample composition is considered together with the observed variations of the critical temperature. A correlation between the width of the conduction band and the critical temperature is revealed and discussed in comparison with the results for other HTSC-systems.

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