PS04

Berry's phase in the multimode Peierls states

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Quantized Berry's phase associated with the adiabatic change of local variables [1] is shown to be useful in the characterization of the multimode Peierls state which has been proposed as a new type of the ground state of two-dimensional systems with the electron-lattice interaction [2]. The conventional Peierls state in two dimension is characterized by one Fourier mode, namely the (π, π) mode, whereas the multimode Peierls states exhibit complicated lattice distortion patterns with more than one Fourier modes. We show that there exists one to one correspondence between the quantized value of Berry's phase and the sign of lattice distortions in the multimode Peierls states [3]. Quantized Berry's phase can therefore be used to characterize the complicated distortion patterns in the multimode Peierls states. This topological characterization in real space reveals the topological stability of the multimode Peierls states and is useful in analyzing the phase transitions between the multimode Peierls states and the conventional Peierls state in the presence of anisotropy [4].

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