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Collective modes of the dinuclear systems at low energy reactions in the vicinity of the coulomb barrier height

At low energy reactions in the vicinity of the coulomb barrier height colliding nuclei may have dynamical deformations. Vibrations of the surfaces of nuclei, occurring within the range of nuclear forces over the colliding time commensurate with the period of vibrations, cannot be independent. The energies of excited stationary vibrational states of a dinuclear system that correspond to deformations of nuclear surfaces along the axis connecting the centers of these nuclei and the wave functions for these states were calculated by solving of the multidimensional Schrodinger equation [1]. We would like to highlight the two most important properties of excited phonons. First, the spacings between di-nuclear vibrational levels depend on R; therefore, the excitation energies in the barrier region are in general different from respective excitation energies in isolated nuclei. Second, the curves representing vibration energies feature avoided-crossing segments within which excited vibrational states involve combinations of several modes and differ substantially from vibrations in isolated nuclei. A physical interpretation of the fine structure of the barrier distribution D(E) [2,3] was given on the basis of a system of effective potential barriers and the population of excited vibration and rotation states.

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