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Nuclear matrix elements of neutrinoless double-β decay in the triaxial projected shell model

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The nuclear matrix elements of neutrinoless double-beta decay for nuclei 76Ge, 82Se, 100Mo, 130Te, and 150Nd are studied within the triaxial projected shell model, which incorporates simultaneously the triaxial deformation and quasiparticle configuration mixing. The low-lying spectra, the B(E2: 0+ to 2+) values, and the occupancies of single-particle orbits are reproduced well. The effects of the quasiparticles configuration mixing, the triaxial deformation, and the closure approximation on the nuclear matrix elements are studied in detail. For nuclei 76Ge, 82Se, 100Mo, 130Te, and 150Nd, the nuclear matrix elements are respectively reduced by the quasiparticle configuration mixing by 6%, 7%, 2%, 3%, and 4%, and enhanced by calculating explicitly the transitions through odd-odd intermediate states by 7%, 4%, 11%, 20%, and 14%. Varying the triaxial deformation gamma from 0◦ to 60◦ for the mother and daughter nuclei, the nuclear matrix elements change by 41%, 17%, 68%, 14%, and 511% respectively for 76Ge, 82Se, 100Mo, 130Te, and 150Nd, which indicates the importance of treating the triaxial deformation consistently in calculating the nuclear matrix elements.

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