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Uncertainty of 0vββ-decay nuclear matrix elements from Pairing

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The uncertainty in the nuclear matrix elements (NMEs) of $0\nu\beta\beta$ decay for ⁷⁶Ge, ⁸²Se, ¹²⁸Te, ¹³⁰Te, and ¹³⁶Xe in the self-consistent quasiparticle random phase approximation (QRPA) method is investigated by using eighteen Skyrme interactions supplemented with either a volume or surface type of pairing interactions. The NMEs for the isotopes concerned (except ¹³⁶Xe) are less sensitive to the particle-hole (ph) interactions, while they are strongly dependent on the employed isovector particle-particle (pp) pairing interactions even though the pairing strengths are optimized to the same pairing gap. While the increase of isoscalar pairing can enhance the the ground-state correlations, which reduces both the $0\nu\beta\beta$ and $2\nu\beta\beta$ NMEs a lot. These results indicate that a precise determination of the pairing interaction in the Skyrme energy density functional is of importance to reduce the uncertainty in the NMEs within the QRPA framework.

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