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Exploring the coupling to nucleon transfer in fusion involving neutron-rich Sn nuclei at energies near the Coulomb barrier

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Neutron-rich fission fragments accelerated to energies around the Coulomb barrier are used for studying the reaction mechanisms of fusion at HRIBF. Fusion excitation functions have been measured using neutron-rich radioactive 132Sn beams incident on Ca and Ni targets. Large sub-barrier fusion enhancement has been observed in the reaction with the 40Ca target. A previously measured fusion excitation function for 40Ca+124Sn suggests that the enhancement is due to multineutron transfer. The Q-values for multineutron transfer in the reaction of 132Sn with 58Ni are comparable to those in the reactions with 40Ca, but the sub-barrier fusion enhancement is significantly smaller. Furthermore, it is a surprise to find that the sub-barrier fusion enhancement for 118Sn+64Ni, which has no positive Q-value for neutron transfer, is comparable to that for 132Sn+58Ni.

To investigate the differences in the correlations between transfer and sub-barrier fusion enhancement for Sn+Ca and Sn+Ni systems, the fusion excitation functions for 124Sn+46,50Ti have been measured. The neutrons transferred from 124Sn to 46Ti populate similar orbitals as those in 132Sn+40Ca but different from those in 132Sn+58Ni. A comparison of the fusion excitation functions for Sn+Ca, Sn+Ti, and Sn+Ni will be presented. Coupled-channels calculations to analyze the contributions of coupling to transfer will be discussed.

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