Predominance of nucleon transfer in sub-barrier reactions of the weakly-bound ^{7}Li and ^{9}Be

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With the discovery of halo nuclei [1, 2], and recent intensive development of radioactive ion beams (RIBs) around the world, there is renewed interest in studying interaction of weakly-bound light nuclei as a basis for understanding interactions of halo nuclei and RIBs. Reactions of the weakly-bound nuclei ^{6,7}Li and ^{9}Be with heavy targets consistently showed [3, 4] suppression of complete fusion by $\sim$30%. The low threshold energies for breakup of Li and Be are widely associated with their observed suppression of complete fusion with breakup described as cluster decay from unbound states independent of the mechanism that populates it [5, 6]. More recent results [7], however, hinted at cluster transfer to be a major contributor to the suppression of complete fusion in Li. From our sub-barrier coincidence measurements for the reactions of ^{7}Li and ^{9}Be with ^{209}Bi, breakup of these weakly-bound nuclei are seen triggered predominantly by nucleon transfer. Thus the probability and characteristics of breakup depend not only on the properties of the initial nucleus but also on those of its neighbours. These results will potentially provide important input to developing a complete model of reactions involving both α-cluster nuclei and exotic nuclei at the limits of existence.

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