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Interesting states in $A = 10$ mass region, populated in ^{10}B + ^{10}B nuclear reactions

A rich variety of nuclear structures occur in light nuclei, in the vicinity of $A = 10$ region, at similar excitation energies. Experimental data for this region is incomplete and often controversial.
Interesting configurations, such as extremely deformed "nuclear molecules"in ^{10}Be, or the still puzzling Hoyle state and its excitations, make this mass region the focus of many new measurements, as well as the aim to complete and systematize light nuclei spectroscopy in general.

Results of nuclear reactions ^{10}B + ^{10}B, measured with 50 and 72 MeV beams, will be presented. The large spin of both beam and target nuclei ($J^\pi = 3^+$) is particularly suitable for the population of high spin states in the exit channels.
Results were obtained for the ^{8,9}Be, ^{9,10,11}B, ^{10,11,12,13}C, ^{14}N, and ^{16}O nuclei. Some of the states in ^{11}B and ^{11}C are populated in one nucleon transfer reaction for the first time. A coincident detection of three α-particles provided the information necessary to reconstruct the details of the ^{10}B + ^{10}B $\rightarrow 5\alpha$ reaction, and associated ^{12}C spectra of intermediate states involved in the process. In particular, a new state at E_x = 24.4 MeV was strongly populated in the triple α-particle coincidences, showing properties similar to the well known 3^- state at E_x = 9.64 MeV. The rarely seen state at E_x = 30.3 MeV is found to be strong in the d+^{10}B decay channel, reinforcing the previous suggestions that it has the exotic $2\alpha + 2d$ molecular structure. In four nucleons transfer reaction channel, excited states of the ^{14}N at E_x = 13.2 and 15.39 MeV were measured. Both of them fit nicely to a recent AMD calculations as the head and the 5^+ state of the ^{10}B(3^+) + α rotational band ($K^\pi = 3^+$).

Preliminary results for ^{7}Be + ^{6,7}Li nuclear reactions, measured with 45 MeV beam, will also be shown.

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