EXPLORING CLUSTERING IN ALPHA-CONJUGATE NUCLEI USING THE THICK TARGET INVERSE KINEMATIC TECHNIQUE FOR MULTIPLE ALPHA EMISSION*

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Searching for alpha cluster states analogous to the $^{12}\text{C}$ Hoyle state in heavier alpha-conjugate nuclei can provide tests of the existence of alpha condensates in nuclear matter. Such states are predicted for $^{16}\text{O}$, $^{20}\text{Ne}$, $^{24}\text{Mg}$, $^{28}\text{Si}$ etc. at excitation energies slightly above the multi-alpha particle decay threshold [1-3].

The Thick Target Inverse Kinematics (TTIK) [4] technique can be successfully used to study the breakup of excited self-conjugate nuclei into many alpha particles. The reaction $^{20}\text{Ne}+\alpha$ was studied using a $^{20}\text{Ne}$ beam at 12 AMeV form the K150 cyclotron at Texas A&M University. Here the TTIK method was used to study both single $\alpha$-particle emission and multiple $\alpha$-particle decays. Events with alpha multiplicity up to four were analyzed. The analysis of the three $\alpha$-particle emission data allowed the identification of the Hoyle state and other $^{12}\text{C}$ excited states decaying into three alpha particles. The results will be shown and compared with other data available in the literature. Although the statistics of events with alpha multiplicity four is low, the data show a structure at about 15 MeV that could indicate the existence in $^{16}\text{O}$ of a state analog to the $^{12}\text{C}$ Hoyle state.