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Alpha-clusters studies in light nuclei using SOLARIS AT-TPC

In light nuclei, the quantum states formed near the cluster-separation threshold favor a large degree of cluster configurations. The ^{10}Be is a well-known cluster nucleus, with a set of states having very large α widths and very small neutron strengths, consistent with the valence neutrons orbiting around the 2-α cores. The cluster decay branching ratios and cluster content are largely uncertain. We recently performed a ^{10}Be+d experiment with the newly commissioned SOLARIS in AT-TPC (Active Target Time Projection Chamber) mode. The AT-TPC was filled with pure deuterium gas at 600 Torr. A cocktail beam of ^{10}Be at 9.6 MeV/u from the ReA6 was delivered to the AT-TPC placed inside the SOLARIS solenoid energized at 3T. Charged particles emitted from multiple reaction channels (d,p), (d,d'), (d,t), (d,^{3}He), (d,α) were identified with their magnetic rigidity and energy-loss profiles. The 7.54-MeV 2^+ resonance state in inelastically scattered ^{10}Be is observed, which is just 0.133 MeV above the alpha-decay threshold. The decay of inelastically scattered ^{10}Be* $\rightarrow^6$He+^{4}He allows us to determine the competition with neutron decay. The 7.54-MeV state could belong to a rotational band built on the below threshold 0_2^+ at 6.18 MeV as bandhead. Preliminary results from the data analysis will be presented.

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