

Spectroscopy of ${}^7\text{He}$ in stopped pion absorption

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Abstract. Formation of the ${}^7\text{He}$ heavy isotope was studied in the reactions of stopped pion absorption by light nuclei. Measurements were performed using the two-arm multilayer semiconductor spectrometer. The ground and excitation states were observed in inclusive measurements of the reaction ${}^9\text{Be}(\pi^-, d)X$ and correlation measurements of the reactions ${}^{10}\text{B}(\pi^-, pd)X$, ${}^{11}\text{B}(\pi^-, pt)X$, ${}^{11}\text{B}(\pi^-, dd)X$, ${}^{12}\text{C}(\pi^-, p^4\text{He})X$, ${}^{12}\text{C}(\pi^-, d^3\text{He})X$ and ${}^{14}\text{C}(\pi^-, t^4\text{He})X$. The existence of several narrow low-lying states ($E_x < 7$ MeV) was observed in all reaction channels. However, their yields were significantly dependent on the type of reaction. While, evidence for the existence of ${}^7\text{He}$ state with $E_x \approx 1$ MeV was not obtained in any of the reaction channels. Contrary to the results of other studies, we observed several narrow highly excited states ($E_x > 16$ MeV) of ${}^7\text{He}$. From the analysis of the continuous excitation spectrum in reactions ${}^9\text{Be}(\pi^-, d)X$ and ${}^{11}\text{B}(\pi^-, dd)X$ it was obtained first indication that the ${}^4\text{He}+3n$ structure is not present in the ground state of ${}^7\text{He}$.