Alpha-particle condensation in nuclei P. Schuck, H. Horiuchi, G. Ropke, A. Tohsaki, C. R. Physique 4 (2003) 537-540

At least light $n\alpha$ -nuclei may show around the threshold for $n\alpha$ disintegration, bound or resonant which are of the α -particle gas type, i. e., they can be characterized by a self-bound dilute gas of almost unperturbed α -particles, all in relative *s*-states with respect to their respective center of mass coordinates and thus forming a Bose condensed state. Such state is quite analogous to the recently discovered Bose condensates of bosonic atoms formed in magnetic traps.

The only nucleus, which shows a well-developed α -particle structure in its ground state is ⁸Be. Other $n\alpha$ -nuclei collapse in their ground states to much denser system where the α -particles strongly overlap and probably loose almost totally their identity. When these $n\alpha$ -nuclei are expanded, at some low densities α -particles reappear forming a Bose condensate. If energy is just right, the decompression may stall around the α -condensate density and the whole system may decay into α particles via the coherent state.

$$^{12}C \rightarrow 3 \alpha, \dots, ^{40}Ca \rightarrow 10 \alpha, ^{48}Cr \rightarrow 3 ^{16}O, ^{32}S \rightarrow ^{16}O+4 \alpha$$