

Direct Reactions at Stable Beam Facilities

The absolute magnitude of the α -particle clustering in heavier nuclei, as expressed by the spectroscopic factor S_α , remains poorly determined. Absolute values of S_α extracted from the traditionally employed (${}^6\text{Li},d$) and (${}^7\text{Li},t$) α -transfer reactions are notoriously variable, indicating that the reaction mechanism is also poorly understood; alternative reactions have not been completely explored to date. Much important work in this area remains to be done with stable beam facilities, particularly systematic studies of the variation in α -clustering along isotopic chains.

As an example we take a hypothetical study of α -particle clustering in Ar and Ca isotopes probed by various α -particle transfer reactions: (${}^6\text{Li},d$), (${}^7\text{Li},t$), (${}^{16}\text{O},{}^{12}\text{C}$) and (${}^{20}\text{Ne},{}^{16}\text{O}$) and their inverse reactions. Estimates of cross sections are compared and some of the requirements for experimental conditions and equipment are discussed.