

Recent results of the $^{12}\text{C} + ^{12}\text{C}$ fusion reactions

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The set of fusion reactions $^{12}\text{C} + ^{12}\text{C}$ play a critical role in several astrophysical processes. Additionally, these reactions have long been both a subject of speculation and a test case for developments in nuclear structure. These developments include the theory quasi-molecular nuclei and very recent sub-barrier fusion hindrance. In a recent study, the fusion reactions $^{12}\text{C} + ^{12}\text{C}$ have been studied at $E_{CM} = 2.10$ to 4.75 MeV by γ -ray spectroscopy using a C target of ultra-low hydrogen contamination. The deduced astrophysical $\tilde{S}(E)$ factor exhibits previously unknown resonances at $E \leq 3.0$ MeV, in particular a strong narrow resonance at $E = 2.14$ MeV, which lies at the high-energy tail of the Gamow peak. The implications of the results to astrophysics and nuclear structure are discussed.