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Alpha-capture reaction rate for 22Ne(alpha,n) via sub-Coulomb alpha-transfer and its effect on final abundances of s-process isotopes

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The 22Ne(alpha,n) reaction is a very important neutron source reaction for the slow neutron capture process (s-process) in asymptotic giant branch stars. Direct measurements are extremely difficult to carry out at Gamow energies due to the extremely small reaction cross section. The large uncertainties introduced when extrapolating direct measurements at high energies down to the Gamow energies can be overcome by determining the partial alpha-width of the relevant states in indirect measurements. This can be done using alpha-transfer reactions at sub-Coulomb energies to reduce the dependence on optical model parameters. The alpha-transfer reaction of 22Ne(6Li,d)26Mg was carried out at the Cyclotron Institute at Texas A&M University to study this reaction. It appears that the widths of the near alpha-threshold resonances of 26Mg are quite different for similar 22Ne(6Li,d) reactions carried out previously using different energies. This discrepancy affects the final 22Ne(alpha,n) reaction rate and thus the final abundances of the s-process isotopes.

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