THE ^{17}O$(p,\alpha)^{14}$N AND ^{17}O$(p,\gamma)^{18}$F REACTION RATES

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The relative abundances of the oxygen isotopes are an important diagnostic of the conditions inside red giant stars. The abundance of the ^{17}O isotope is particularly sensitive to stellar mixing and convection caused by the extreme temperature dependence of the two nuclear reactions that destroy ^{17}O, ^{17}O$(p,\alpha)^{14}$N and ^{17}O$(p,\gamma)^{18}$F. This strong temperature dependence results from the properties of 4 resonances near the proton threshold in ^{18}F. There have been several recent measurements that studied the properties of these states since the last published reaction rate evaluation.[1] We are performing a new evaluation of the ^{17}O$(p,\alpha)^{14}$N and ^{17}O$(p,\gamma)^{18}$F reaction rates based on the new experimental information available. Since a much more accurate rate is now possible, we include smaller contributions (such as from interferences and higher lying resonances) that were neglected in previous evaluations. Careful consideration is given to identifying and quantifying the uncertainties in these rates. This evaluation has already led us to a new measurement of the ^{17}O$(p,\gamma)^{18}$F reaction that addresses one of the most significant remaining uncertainties in this rate.[2] The improved reaction rate will be published and disseminated on the World Wide Web when the ^{17}O$(p,\gamma)^{18}$F measurement is complete.

[1] G. R. Caughlan and W. A. Fowler, At. Data Nuc. Data Tables 20, 283 (1988).

[2] J. C. Blackmon *et al.*, "Search for the 180-keV resonance in ^{17}O$(p,\gamma)^{18}$F," this report (1999).