Abstract Submitted
for the DNP06 Meeting of
The American Physical Society

A new ^{30}P(p,γ)^{31}S reaction rate and its astrophysical implications[1] Z. MA, M. GUIDRY, U. of Tenn, D.W. BARDAYAN, J.C. BLACKMON, W.R. HIX, M.S. SMITH, Oak Ridge National Lab, R.P. FITZGERALD, D.W. VISSER, UNC - Chapel Hill, K.L. JONES, J.S. THOMAS, Rutgers, R.L. KOZUB, Tenn Tech U., R.L. LIVESAY, Colorado School of Mines — The ^{30}P(p,γ)^{31}S reaction rate plays a crucial role in the synthesis of heavier elements in ONe nova outbursts. However, this rate is very uncertain due to the lack of spectroscopic information on the ^{31}S levels. We have measured differential cross sections for the ^{32}S(p,d)^{31}S reaction and determined excitation energies for 26 states in ^{31}S. Spins and parities were determined or constrained for strongly populated levels through a DWBA analysis. A total of 42 levels in ^{31}S were examined. A new ^{30}P(p,γ)^{31}S rate was calculated using this new resonance information. Our results indicate that the ^{30}P(p,γ)^{31}S rate is reduced by up to a factor of 10 at nova temperatures compared to an estimate made with a statistical reaction model. We have performed network calculations using the new rate. Production of elements in the Si-Ca region are found to be altered by as much as 30%. Important isotopic ratios such as ^{12}C/^{13}C, ^{14}N/^{15}N, ^{26}Al/^{27}Al and ^{29,30}Si/^{28}Si are found to agree well with observations on presolar grains of nova origin.

[1]Managed by UT-Battele, LLC for the U.S. DOE under contract DE-AC05-00OR22725

Z. Ma
U. of Tennessee, Knoxville

Date submitted: 29 Jun 2006 Electronic form version 1.4