$^{18}F(a,p)^{21}Ne$ reaction: neutron source for r-process in supernovae

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Recent observation of the abundance distribution of heavy elements in metal poor old stars give an indication of the existence of more than one r-process site. One of models suggested the r-process nucleosynthesis in the supernova shock through the He-rich shell of the pre-supernova star. In the helium rich environment, a possible neutron source for the second r-process would be the reaction sequence of $^{14}N(a,?)^{18}F(a,p)^{21}Ne(a,n)^{24}Mg$ with rapid depletion of ^{14}N. The (a,p) reaction of ^{18}F will be faster than $ß^{+}$ decay at the high densities and temperature in the shock. The $^{18}F(a,p)^{21}Ne$ reaction and the inverse reaction $^{21}Ne(p,a,)^{18}F$ were measured in CRC and in Notre Dame in the range of Gamow energy. Experimental results will be discussed to compare the results with Hauser-Feshbach calculations.