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Nova nucleosynthesis from phosphorus to the endpoint

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Classical nova explosions take place in binary star systems, in which a white dwarf is accreting matter from its companion star. Once enough material has been accreted, a thermonuclear runaway occurs on the white dwarf's surface, and the subsequent explosion ejects material into the interstellar medium. The thermonuclear 30P(p,γ)31S reaction rate influences the elemental and isotopic abundances of O-Ne nova nucleosynthesis, which affect the calibration of proposed nova thermometers and the identification of presolar grains of nova origin. The 38K(p,γ)39Ca reaction in turn influences the dynamics of the nucleosynthesis endpoint near A = 40, producing Ar and Ca in potentially observable amounts. Both reactions have lacked sufficient constraints from experiments. We will present experiments on these two reactions, using the β decay of 31Cl to populate levels of 31S of importance to the 30P(p,γ)31S reaction; and the first direct measurement of the 38K(p,γ)39Ca reaction using a beam of radioactive 38K.

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