Capture Fission Cross-sections for K+Ta Reactions

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The formation of a heavy evaporation residue is the final step in a nuclear fusion reaction where first capture and then compound nucleus formation must take place. Calculations of survival probabilities for evaporation residues thus depend on an understanding of capture cross sections, though in some cases existing models make unsatisfyingly disparate predictions. New measurements are therefore needed to constrain these models, in particular for reactions of neutron-rich nuclei, which might in future be used to create new isotopes of heavy elements.

In October 2015 a new fission detector setup was used for the first time at the National Superconducting Cyclotron Laboratory at MSU which provided a determination of the relative cross sections for capture-fission for the 39,45K + 181Ta reactions, spanning the energy of the capture barrier. Subsequent measurements for 39K+181Ta at the ANU have determined the mass-angle distributions and capture cross sections over the same energy region. These results and a comparison to theoretical predictions will be presented.