# Fission products yields in photo-fission of $^{232}$Th for end-point bremsstrahlung energy of 10 and 50 MeV

H. Naik[a*], G. Kim[b], S.V. Suryanarayana[c], V.T. Nimbje[d], D. Raj[e], S.N. Acharya[d],
Newton Nathaniel[a], M.W. Lee[f], K.S. Kim[b], K.C. Mittal[d], A. Goswami[a],
S. Ganesan[e], M. H.Cho[f], I.S. Ko[f], W. Namkung[f], K.L. Ramakumar[g],

*a- Radiochemistry Division, Bhabha Atomic Research Centre, Mumbai, India -400085.*
*b- Dept. of Physics, Kyungpook National University, Daegu 702-701, Republic of Korea.*
*c- Nuclear Physics Division, d- Accelerator and Pulse Power Division,*
*e- Reactor Physics Design Division, BARC, Mumbai, India -400085.*
*f- Department of Physics, Pohang University of Science and Technology, Pohang*
*790-784, Republic of Korea*
*g- Group Director, Radiochemistry and Isotope Group, Mumbai, India -400085.*

**Abstract**

The fission yields of various fission products in the mass region 77-153 in the 10 and 50 MeV bremsstrahlung-induced fission of $^{232}$Th have been determined using a recoil catcher and off-line γ-ray spectrometric techniques in the electron linac at EBC, Kharghar, Navi-Mumbai and Pohang Accelerator Laboratory, Korea. From the yield data, mass yield distributions were obtained using charge distribution corrections. From the mass yield data, the peak-to valley (P/V) ratio was obtained. These data along with literature data at other energies in $^{232}$Th(γ, f) and $^{238}$U(γ, f) shows: (i) The yields of fission products for A =133-134 and 143 -144 and their complementary products in $^{232}$Th(γ, f) and $^{238}$U(γ, f) are higher than other fission products due to the presence of spherical 82n and deformed 86-88n shell effect. (ii) At the peak position, the yields of fission products are higher in the interval of five mass units, which is due to even-odd effect. (iii) The peak to valley (P/V) ratio at all excitation energies is always lower in $^{232}$Th(γ, f) than in $^{238}$U(γ, f) due to the presence of a third peak in the symmetric mass region. The fission yield data in $^{232}$Th(γ, f) are important for ADS. This is because in ADS, the high energy proton from the accelerator strikes the Pb or Bi target to generate high energy neutron from spallation reaction. During spallation process, high energy photons are also produced along with neutron. Thus, the yields of fission products in high energy photon induced fission of $^{232}$Th and long-lived minor actinides are necessary for decay heat calculation and thus for the design of ADS.