A CLUSTER DECAY MODEL FOR PROTON RADIOACTIVITY FROM DRIPLINE NUCLEI

S. Ravi Kasi Venkataraman[a)], P. Arumugam[b)], S. K. Patra[b)], and Raj K. Gupta[c)]

[a)] *Govt. Higher Secondary School, Sayalkudi - 623 120, Tamilnadu, India*

[b)] *Institute of Physics, Sachivalaya Marg, Bhubaneswar - 751 005, India*

[c)] *Department of Physics, Panjab University, Chandigarh - 160 014 India*

A new simple approach based on cluster decay model [1] has been put forth to study proton radioactivity. This model comprise Yukawa-plus-exponential potential for the post scission region and the inner part is connected smoothly by a third order polynomial. To study sensitiveness of the decay rates to the orbital angular momentum, a centrifugal barrier is added to the region after the touching configuration. The deformation effects of parent as well as the daughter nuclei are taken care. The finite range effects around the touching configuration has been treated properly. Only some minor modifications were made to the cluster decay model to take into account the proton radius and its surface-asymmetry constant. Calculations are performed for several experimentally seen, spherical and deformed nuclei around the proton drip line and some of the results are shown in Fig. 1. Without any adjustable parameters in the formalism, the half-life values calculated by our approach are shown to be well in conformity with experimental and other theoretical results [2]. The centrifugal barrier plays vital role in proton radioactivity. Our results are found to be very sensitive to the angular momentum of the proton emitter. Deformation effects in the parent as well as the daughter nuclei are also found to alter the half-life values considerably. Hence, with commendable satisfaction, proton radioactivity can be explained in a way very similar to cluster decay and alpha decay.

[1] G. Shanmugam and B. Kamalaharan, Phys. Rev. C **38**, 1377 (1988); Phys. Rev. C **41**, 1184 (1990).

[2] B. Barmore, *et al.*, Phys. Rev. C **62**, 054315 (2000).

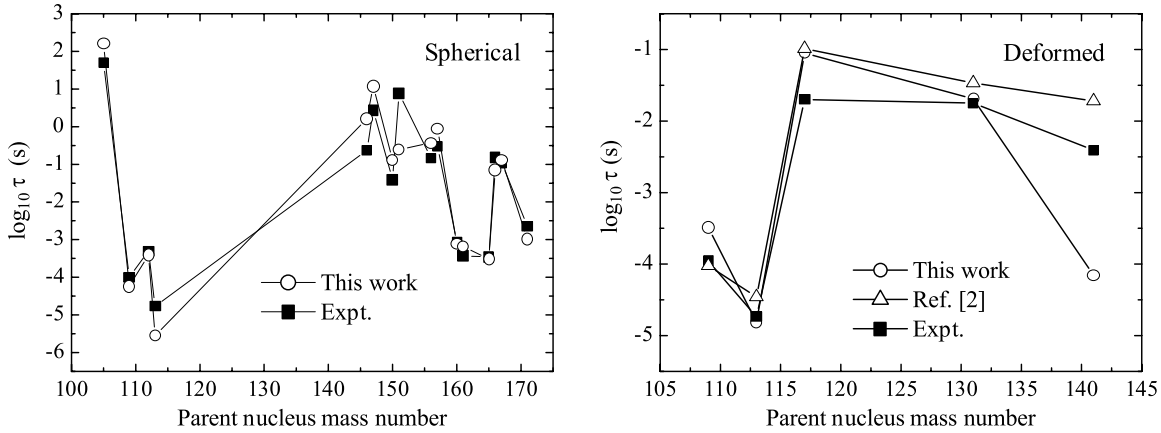

Figure 1: Theoretical and experimental half-lives of spherical and deformed proton emitters.