

## Sigurd Hofmann and the discoveries of proton radioactivities\*

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Sigurd Hofmann was one of the most successful pioneers in the charged particle radioactivity field. He and his colleagues working at GSI SHIP spectrometer are recognized as the discoverers of the first ground-state proton radioactivity of  $^{151gs}\text{Lu}$  [1] after experiments performed in 1981. However, one should note that over 10 years earlier, Jackson *et al.* [2] and Cerny *et al.* [3] have identified a proton transition from the isomeric state  $^{53m}\text{Co}$  to  $^{52}\text{Fe}$  at Oxford and Lawrence Berkeley laboratories. Just after successful SHIP experiment on  $^{151}\text{Lu}$ , the group operating on-line mass separator at GSI reported a proton line assigned to the ground-state decay of  $^{147}\text{Tm}$  [4]. SHIP experiments added the proton-emitting isomer  $^{147m}\text{Tm}$  and  $^{150}\text{Lu}$  [5] to the proton radioactivities and confirmed Munich results on proton emitters  $^{109}\text{I}$  and  $^{113}\text{Cs}$  [6,7].

Sigurd Hofmann is mostly known for his important contributions to the discoveries of six new elements at GSI SHIP, from Z=107 Bohrium (Bh) to Z=112 Copernicium (Cn). He was the first author of the manuscript presenting the discoveries of new elements Z=110 Darmstadtium (Ds), Z=111 Roentgenium (Rg) and Z=112 Copernicium (Cn). If fact, he is also among the co-authors of the discovery of element 114 Flerovium (Fl) at JINR Dubna.

Sigurd got numerous awards and distinctions during his busy and successful life (1944-2022). These awards included Physics Prize of German Physical Society (1984), the Otto Hahn Prize (1996), G.N. Flerov Prize (1997) as well as SUN-AMCO medal of IUPAP (1998). However, I'm sure the 2011 awards from Poland, namely the Nicolaus Copernicus Medal and the Medal of the City of Torun were close to his heart since he proposed the name Copernicium for element 112.

ORNL team working at the Holifield Radioactive Ion Beam Facility continued the discovery path started at GSI by Hofmann and his colleagues, by adding  $^{151m}\text{Lu}$  [8],  $^{150m}\text{Lu}$  [9], as well as  $^{145}\text{Tm}$  [10],  $^{140}\text{Ho}$  and  $^{141m}\text{Ho}$  [11] to proton radioactivities. Important results included the observation of a fine structure in proton emission from  $^{145}\text{Tm}$  [12],  $^{146}\text{Tm}$  [13] and  $^{141}\text{Ho}$  [14].

The region of proton and alpha emitters above doubly-magic  $^{100}\text{Sn}$  was investigated, too, at the HFRIBF. Among the highlights was the study of  $^{109}\text{I}$  alpha-decay [15] relevant for the  $S_p$  value of  $^{105}\text{Sb}$ , more proton-bound than earlier reported [15].

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