

# Studies of Decay Modes for Superheavy Nuclei with $Z = 118 - 122$ and $N \approx 172$

**C.I. Anghel, I. Silisteanu**

Horia Hulubei National Institute for R&D in Physics and Nuclear Engineering,  
Str. Reactorului 30, RO-077125, POB MG6, Bucharest-Măgurele, Romania

The possibility of existing long-lived superheavy nuclei (SHN) around  $Z = 120$  and  $N = 172$  is explored by studying the competition between  $\alpha$ -decay and spontaneous fission (SF) in the isotopic sequences of elements  $Z = 118-122$ . Within the reaction theory the  $\alpha$ -decay half-lives are estimated by using two different formation factors (FF): i) the microscopic shell model (SM) FF including the structure effects (due to nuclear shells and finite sizes of nucleons); and ii) the simple “one body” (ob) FF without the structure effects. Also, the  $\alpha$  and SF half-lives are estimated with simple formulas obtained by fitting data for decay modes of SHN. A comparative analysis of these lifetimes helps us to predict the main decay modes for unknown SHN and to estimate the contribution of the structure effects to the increasing of nuclear stability against  $\alpha$ -decay. The advantages and limits of the used theoretical approaches and empirical models used in the description of decay properties are discussed.