DYNAMICAL EVOLUTION OF SUPER-HEAVY SYSTEMS STUDIED USING THE X-RAY FLUORESCENCE TECHNIQUE

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The dynamical evolution of super-heavy systems on their potential landscape and the possible existence of a potential pocket allowing compound nucleus formation can be efficiently probed with the X-ray fluorescence process. The latter gives rise to characteristic X-rays, powerful tools to achieve atomic number (Z) identification of the emitting atoms. Furthermore, it provides us with a sensitive clock for nuclear fission (as well as for any other process where a Z modification of the atoms occurs), provided the fission time distribution presents sizeable components with lifetimes of the same order of magnitude as the lifetimes of the electronic vacancies responsible for the atomic fluorescence.

The X-ray fluorescence technique has thus been applied in order to get evidence for compound nucleus formation from long lifetime components in the fission time distributions. Three systems have been studied with projectile energies around 6 MeV/nucleon: $^{238}U + ^{64}Ni$, $^{238}U + ^{76}Ge$ and $^{48}Ti + ^{238}U$. The first two systems were studied at Ganil using reverse kinematics that permitted fission fragment Z identification by ΔE-E technique. For the last system, studied at the Australian National University in direct kinematics, fission fragment masses were determined from their relative flight times, whereas their atomic numbers were simultaneously determined from X-ray fluorescence. For the 3 systems, the fission time distributions have been probed and, for the last one, the initial N/Z of the fission fragments (N being the number of neutrons) has been determined as a function of the energy dissipation and mass asymmetry.