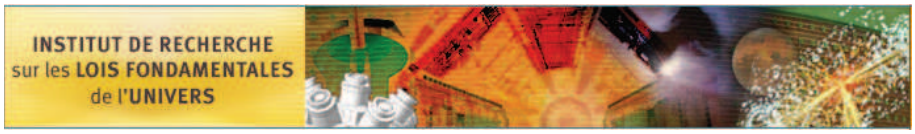
Service de Physique Nucléaire



Séminaire

le jeudi 4 septembre 2014 à 11h

CEA Saclay, Orme des Merisiers, Bât. 703, Salle 135

New perspectives in superheavy element chemistry and nuclear spectroscopy
First investigation of seaborgium hexacarbonyl

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SuperHeavy Elements (SHE) provide unique possiblities to study the influence of relativistic effects on the electronic structure. However, until recently, only a limited number of thermally stable, inorganic compounds of SHEs have been accessible due to technical restrictions[1]. Thanks to the approach of physical preseparation [2], many limitations could be overcome. We have developed in experiments at the TRIGA reactor in Mainz and at the TASCA separator at GSI a method to synthesize carbonyl complexes of short-lived isotopes [3]. This method has now been successfully applied at the GARIS separator at RIKEN to synthesize for the first time a carbonyl complex of a superheavy element – Seaborgium hexacarbonyl [4].
^{265}Sg was synthesized in the reaction ^{248}Cm(^{22}Ne,5n), separated from the primary beam, and was thermalized in a He/CO mixture behind GARIS. This way it formed a volatile complex and was transported in the gas stream to a COMPACT gas-chromatography detector[6], where its adsorption on SiO_2 was studied. The chemical properties of seaborgium were compared to its lighter homologs molybdenum and tungsten. The combination of physical and chemical separation allowed studying the decay of ^{265}Sg under background- free conditions. Our results indicate the observation of $Sg(CO)_6$ and provide new information on the nuclear properties of ^{265}Sg.
Experimental details and results will be presented in the seminar. An outlook on future applications of CO chemistry in superheavy element research and as a new tool for background-free decay spectroscopy will be given.

[1] A. Türler and V. Pershina, Chem. Rev. 113, 1237-1312 (2013).
[2] Ch.E. Düllmann et al., Nucl. Instr. Meth. A 551, 528539 (2005).
[3] J. Even et al., Inorg.Chem. 51, 6431-6422 (2012).
[4] J. Even et al, accepted for publication in Science (2014).
[5] H. Haba et al., Phys. Rev. C 85, 024611(2012).
[6] A. Yakushev et al., Inorg. Chem. 53, 1624 (2014).

Le café sera servi 10 minutes avant

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