Functionalization of porous Metal-Organic Framework materials for the capture of iodine.

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Since decades, a main issue of concern for safety associated with nuclear energy is the management of nuclear waste and its release in the case of a serious malfunctioning. Unfortunately, the recent accident of the Daiichi-Fukushima nuclear plat reminds us these facts.

To solve this problem, we would like to develop porous Metal-Organic Framework (MOF) compounds for the capture and/or the separation of species produced by the nuclear industry, especially iodine derivatives. MOFs are a recent class of hybrid (organic ligands connected to a metal) materials showing a higher porosity than other porous solids like zeolites.[1] They already lead to revolutionary properties in different industrial fields like gas storage, catalysis or medicine.

During this internship we would like to optimize MOF for the capture of volatile iodine (I_2). Our strategy will be to functionalize these porous materials using organic chemistry or metal doping, in order to graft chemical groups facilitating the capture of iodine.
Several techniques of synthesis (hydrothermal, micro-wave….) or characterization (X-ray diffraction, Nuclear Magnetic Resonance, *in-situ* UV-Vis, RAMAN spectroscopy, gas sorption analysis) will be utilized by the student.

This project follows very promising results[2,3] and will be done through a collaboration between our team located at Villeneuve d'Ascq campus and the French Radioprotection and Nuclear Safety Institute (IRSN at Cadarache, France).

References:
[1] G.Férey, Chem. Soc. Rev. 2008, **37**, 191.
[2] C. Volkringer *et al.*, Chem. Commun. 2013, **49**, 10320.
[3] C. Volkringer *et al.*, Chem. Commun. 2016, **52**, 12502.

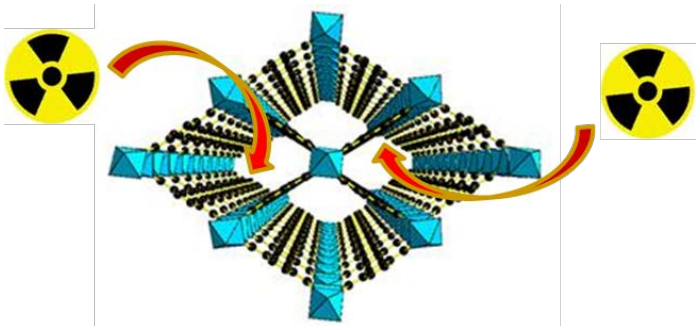

Illustration of the capture of radioactive species by a porous Metal-Organic Framework