Research Grants for PhD students from the China Scholarship Council

Information Form (please read the guidelines carefully on the website www-csc.utt.fr)

Supervisor's name : AUDEBRAND Given names : Nathalie

Status (prof., assistant prof., …) : Prof.

Laboratory : INSA Rennes, Insitute of Chemical Sciences (Solid State Chemistry and Materials Team) Website address : https://iscr.univ-rennes.fr & https://iscr-csm.insa-renne

Institution : INSA Rennes Website address : https://www.insa-rennes.fr

Scientific competence of the supervisor:

Synthesis of coordination polymers and MOFs, structural characterization from single-crystal and powder X-ray diffraction data, study of the reactivity of MOFs (activation, guest inclusion, thermal stability), study of the luminescent properties of coordination polymers.

Two major publications in the field proposed for the PhD :

1. W.P. Lustig et al. Chem. Soc. Rev., 2017, 46, 3242-3285
2. Y. Zhang, et al., Coord. Chem. Rev., 2018, 354, 28-45

Website address of the personal page : https://iscr.univ-rennes.fr/nathalie-audebrand

Supervisor's email : nathalie.audebrand@insa-rennes.fr

Description of the research work proposed for a PhD ***Topic # (see list) :*** IV-11

Title : Luminescent MOFs as chemical sensors

Subject :

Metal-Organic-Frameworks (MOFs) are coordination compounds with organic ligands and metal centers containing potential voids. These materials have been extensively studied over the last twenty years due to the variety and modularity of their crystalline architectures, their porosity and therefore their applications for the storage of molecules, separation, purification, catalysis and even the controlled release of drugs. MOFs built from transition metals combine the properties of porosity with luminescence which make them the materials of choice as chemical sensors. Indeed, thanks to their structural versatility they are able to host molecules with various size, shape and functionality. A judicious choice of the ligand and metal cations would offer to detect various species like cations, anions, molecules (liquid or vapor state). The PhD thesis will consist in the synthesis, structural characterization of luminescent MOFs.The luminescent properties of the MOFs loaded with various analytes will be studied and the influence of the nature of the cations and linkers on the detection and the selectivity in case of a mixture of analytes will be evaluated.

Keywords :

Metal-Organic-Frameworks, coordination polymers, luminescence, chemical sensors

Expected collaborations :

In situ/operando powder X-ray diffraction and theroretical calculations with colleagues in Institute of Chemical Sciences, on the same campus in Rennes.

Background required from the applicant :

Chemical synthesis (inorganic synthesis in solid state), solid state chemistry, structural characterization (XRD, IR), TGA/DSC, luminescence characterization (UV-vis spectroscopies). A keen interest in experimental work is essential. A good level (at least B2) of written and spoken English is mandatory.

Existence of a PDF file detailing the proposal ("yes" or "no") : yes

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