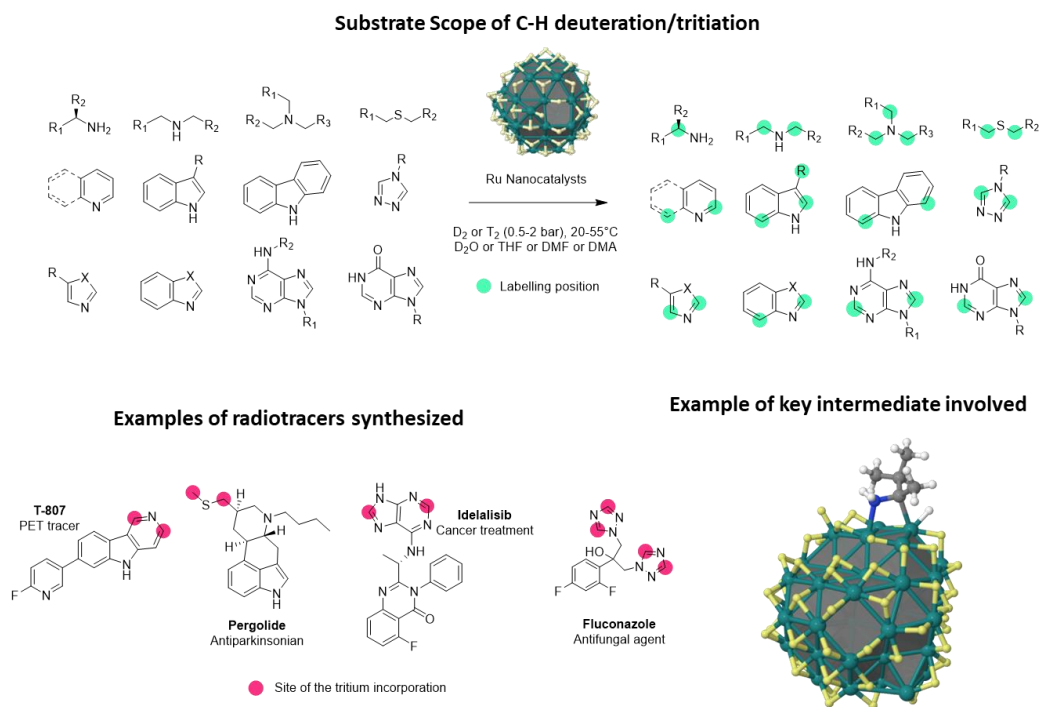


HYDROGEN ISOTOPE EXCHANGES CATALYZED BY RU NANOCATALYSTS

Grégory Pieters^a

a) SCBM, CEA, Université Paris Saclay, France, gregory.pieters@cea.fr

Deuterated and tritiated compounds are widely used in numerous applications in Chemistry, Biology and Material Science.^[1a] In the drug discovery and development process for example, tritiated molecules are often employed as radiotracers for Absorption, Distribution, Metabolism and Excretion (ADME) studies. In metabolomics and related fields of research, deuterated molecules are essential for absolute quantification through internal standardization. Therefore, the development of efficient and selective methods for the late-stage incorporation of hydrogen isotopes into complex molecules is of paramount importance.^[1b] In this context, we have recently developed hydrogen isotope exchange reactions (see figure below) allowing the labelling of numerous substructures (alkylamines^[2a-c], thioethers^[2d], heterocycles^[2a] & ^[2e-f]) in complex molecules through selective C-H activation processes catalyzed by Ru nanoparticles. In terms of application, these reactions have been proven to be useful for the preparation of deuterated LC-MS/MS reference materials (including oligonucleotids^{2f}) and tritiated pharmaceuticals possessing high specific activities. On a fundamental viewpoint, theoretical calculations have revealed the formation of unprecedented key intermediates, explaining the regioselectivities of the C-H activation processes occurring at the surface of the Ru nanocluster.



References:

[1]: a) J. Atzrodt *et al.*, *Angew. Chem., Int. Ed.* **2018**, 57, 3022; (b) J. Atzrodt *et al.*, *Angew. Chem., Int. Ed.* **2018**, 57, 1758; [2]: a) G. Pieters *et al.*, *Angew. Chem., Int. Ed.* **2014**, 53, 230; (b) C. Taglang *et al.*, *Angew. Chem. Int. Ed.* **2015**, 54, 10474; (c) L. M. Martinez-Prieto *et al.*, *Chem. Commun.* **2017**, 53, 5850; (d) L. Gao *et al.*, *Chem. Commun.* **2018**, 54, 2986; (e) V. Pfeifer *et al.*, manuscript in preparation; (f) A. Palazzolo *et al.*, to be submitted