DESIGN OF ECO-COMPATIBLE CATALYSTS FOR ORGANIC CHEMISTRY

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The development of efficient and eco-compatible catalytic systems enabling the preparation of organic compounds is of great concern.

For reaching this objective, we are exploring two complementary approaches. The first one consists in designing molecular catalysts based on cheap and abundant transition (Cu) or main group (Na, Ca, Mg) metals.[1] In a second approach, nanocatalysts are prepared, either by synthesizing metal nanoparticles (NPs)[2] or by grafting catalytically active metal complexes onto nanosized supports (e. g. magnetic nanoparticles,[3] silsesquioxane nanocages[4]). All these nanocatalysts combine high activities and recyclability, and are thus attractive in the context of sustainable development.

In both approaches, the key main transformations studied include cross-coupling reactions and (transfer) hydrogenation processes. The products formed include biaryls, alcohols or amines, which are highly important building blocks due to their omnipresence in natural products, pharmaceuticals or agrochemicals.

This lecture more particularly deals with our recent results concerning catalysts based on metal NPs[2,3] and silsesquioxane supports[4]. In the former topic, metal nanoparticles can act as supports if magnetic (e. g. Co(0) NPs),[3] or be catalytically active by themselves (Ru(0), Cu(0), Pd(0)[2]). The latter topic, developed in close collaboration with Prof. Masafumi Unno and Dr. Yujia Liu from Gunma University in Japan, concerns the synthesis of unprecedented functionalizable silsesquioxane nanocages and their application as supports for molecular catalysts.[4]

<u>References</u>

1. (a) Y. Boumekla, F. Xia, L. Vidal, C. Totée, C. Raynaud, A. Ouali, *Org. Biomol. Chem.* **2023**, *21*, 1038; (b) J. Ballester, A.-M. Caminade, J.-P. Majoral, M. Taillefer, A. Ouali, *Catal. Commun.* **2014**, *47*, 58.
2. (a) L. Ouyang, V. Noël, A. Courty, J.-M. Campagne, A. Ouali, E. Vrancken, *ACS Appl. Nano. Mater.* **2022**, *5*, 2839. (b) D. Mesguich, L. Moumaneix, V. Henri, M. Legnani, V. Collière, J. Esvan, A. Ouali, P. Fau, *Langmuir* **2022**, *38*, 8545. (c) N. G. Garcia-Pena, A.-M. Caminade, A. Ouali, R. Rédon, C.-O. Turrin, *RSC Adv.* **2016**, *6*, 64557 & unpublished results.
3. (a) H. Asri, O. Dautel, A. Ouali, *ACS Appl. Nano. Mater.* **2020**, *3*, 11811. (b) M. Keller, V. Collière, O. Reiser, A.-M. Caminade, J.-P. Majoral, A. Ouali, *Angew. Chem. Int. Ed.* 2013, *52*, 3626 & unpublished results.
4. (a) Y. Liu, K. Koizumi, N. Takeda, M. Unno, A. Ouali, *Inorg. Chem.* **2022**, *61,* 1495. (b) Y. Liu, A. Endo, P. Zhang, A. Takizawa, N. Takeda, A. Ouali, M. Unno, *Silicon* **2022,** *14*, 2723. (c) Y. Liu, M. Katano, P.-K. Yingsukkamol, N. Takeda, M. Unno, A. Ouali, *J. Organomet. Chem.* **2022**, 122213. (d) Y. Liu, M. Kigure, R. Okawa, N. Takeda, M. Unno, A. Ouali, *Dalton Trans.* **2021**, *50*, 3473. (e) Y. Liu, N. Takeda, M. Kigure, K. Koizumi, M. Unno, A. Ouali, *Inorg. Chem.* **2020**, *59*, 15478. (f) Y. Liu, N. Takeda, A. Ouali, M. Unno, *Inorg. Chem.* **2019**, *58*, 4093. (g) Y. Liu, K. Onodera, N. Takeda, A. Ouali, M. Unno, *Organometallics* **2019**, *38*, 4373 & unpublished results.