UNIVERSITÄT SALZBURG

DEPARTMENT OF CHEMISTRY AND PHYSICS OF MATERIALS

ANNOUNCEMENT

Vortragsankündigung

Mittwoch, 7. Oktober 2026, 11.00 Uhr im SR I

Prof. Dr. Jean-Cyrille HIERSO

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"Diamondoids Chemistry for Catalysis and Sensing"

Diamondoids (molecular nanodiamonds) are hydrogen-terminated, nanometer-sized sp^3-carbon cages. Adamantane and diamantane are the smallest members, and their selective functionalization enables precise control of their assembly and reactivity [1]. We demonstrated that functionalized diamondoids can undergo controlled self-assembly into organic micro- and nanocrystals by mild physical vapor deposition [2]. This platform was further exploited for the bottom-up fabrication of organic–inorganic nanocomposites, through the low-temperature chemical vapor deposition of ultrathin metal layers onto phosphine-functionalized diamondoid scaffolds [3]. Palladium–diamondoid composites enabled reversible detection of toxic NO_2 and NH_3, with detection limits down to 50 ppb and 25 ppm, respectively, and fast response and recovery at 100 °C [4].

Sulfur-functionalized adamantane and diamantane derivatives provided access to dense networks of sub-2-nm metal nanoparticles [5]. Bifunctional dithiols act simultaneously as rigid molecular linkers and surface stabilizers, allowing control over nanoparticle size and interparticle distances. Gold nanoparticle networks displayed remarkable selectivity in heterogeneous enyne cyclization, arising from cooperative surface effects [5]. Related recoverable ruthenium nanocatalysts enabled selective alkyne hydrogenation [6], while metal nanoparticles supported in diamondoid-based architectures provided efficient ammonia-borane dehydrogenation for H_2 production [7,8]. These studies highlight diamondoids as versatile molecular scaffolds for controlling metal nanostructures and their catalytic and sensing properties.

References

1. M. A. Gunawan, J.-C. Hierso, D. Poinsot, A. A. Fokin, N. A. Fokina, B. A. Tkachenko, P. R. Schreiner. *New J. Chem.* **2014**, *38*, 28.
2. M. A. Gunawan, D. Poinsot, B. Domenichini, C. Dirand, S. Chevalier, A. A. Fokin, P. R. Schreiner, J.-C. Hierso. *Nanoscale* **2015**, *7*, 1956.
3. M. A. Gunawan, O. Moncea, D. Poinsot, M. Keskes, B. Domenichini, O. Heintz, R. Chassagnon, F. Herbst, R. M. K. Carlson, J. E. P. Dahl, A. A. Fokin, P. R. Schreiner, J.-C. Hierso. *Adv. Funct. Mater.* **2018**, 1705786.
4. O. Moncea, J. Casanova-Chafer, D. Poinsot, L. Ochmann, C. D. Mboyi, H. O. Nasrallah, E. Llobet, I. Makni, M. El Atrous, S. Brandès, Y. Rousselin, B. Domenichini, N. Nuns, A. A. Fokin, P. R. Schreiner, J.-C. Hierso. *Angew. Chem. Int. Ed.* **2019**, *58*, 9933.
5. H. O. Nasrallah, Y. Min, E. Lerayer, T.-A. Nguyen, D. Poinsot, J. Roger, S. Brandès, O. Heintz, P. Roblin, F. Jolibois, R. Poteau, Y. Coppel, M. L. Kahn, I. C. Gerber, M. R. Axet, P. Serp, J.-C. Hierso. *JACS Au* **2021**, *1*, 187.
6. Y. Min, H. Nasrallah, D. Poinsot, P. Lecante, Y. Tison, H. Martinez, P. Roblin, A. Falqui, R. Poteau, I. del Rosal, I. C. Gerber, J.-C. Hierso, M. R. Axet, P. Serp. *Chem. Mater.* **2020**, *32*, 2365.
7. C. D. Mboyi, D. Poinsot, J. Roger, K. Fajerwerg, M. L. Kahn, J.-C. Hierso. *Small* **2021**, 2102759.
8. D. Poinsot, M. Bouzid, A. Burlot, C. D. Mboyi, P.-E. Doulain, J. Paris, O. Heintz, B. Domenichini, V. Colliere, M. L. Kahn, J.-C. Hierso. *ChemNanoMat* **2022**, e202200285.