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Catalysis by design: From conventional solid state NMR spectroscopy to the dynamic nuclear polarization surface enhanced spectroscopy - The success story of single site well-defined heterogeneous catalysts

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Heterogeneous catalysis is ubiquitous today and is central to solving many of the key problems facing chemistry including energy and environmental issues that contribute to a sustainable world. However, the main drawback is due to the multiplicity of active sites in terms of surface and bulk structure which makes it difficult to reflect the intrinsic efficiency of catalysts. The concept of catalysis by design requires the establishment of structure-activity relationship. Surface organometallic chemistry (SOMC) thanks to its solid track record, provides a single-site strategy by creating well-defined surface organometallic fragments (SOMF) that are presumed to be part of the catalytic cycle. To achieve this goal, the surface complexes need to be unambiguously characterized by advanced multi-dimensional solid-state NMR spectroscopy. Recently, the sensitivity limitations encountered with the conventional solid state NMR spectroscopy have been overcome by the emergence of dynamic nuclear polarization surface enhanced spectroscopy (DNP-SENS) that requires the use of polarizing agent (radical nitroxide). DNP-SENS can be now successfully applied to characterize highly sensitive SOMF in reasonable acquisition time. By combining these essential and powerful spectroscopic tools, structureactivity relationships can be highlighted.

Biography

Anissa Bendjeriou-Sedjerari is a Research Scientist at KAUST Catalysis Center and completed her PhD in Materials Science at University of Science and Technology of Montpellier, France. Her main topics of research are "Designs and characterizations of heterogeneous catalysts (FT-IR, solid state NMR spectroscopy, DNP-SENS) applied to the C-H/C-C cleavage and activation (alkanes/olefins metathesis), CO2 activation etc. She is an active member of the Middle East Process Engineering Conference and Exhibition (MEPEC).

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