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ENERGYPOLIS SEMINAR

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Uncovering the changes on Raney Ni properties under Biomass upgrading reactions

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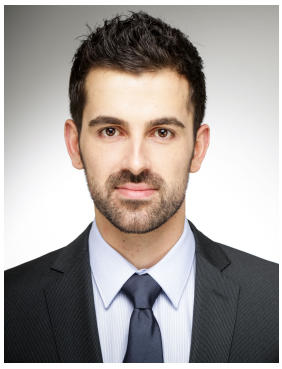
To better understand a catalyst largely used in industrial processes, here employed in new and renewable applications. Detailed structural and surface analyses of Raney Ni used in the wood catalytic upstream and dehydrogenation of limonene process was performed. Several techniques as (1) X-ray diffraction (XRD), (2) X-ray photoelectron spectroscopy (XPS), (3) transmission electronic microscopy (TEM), (4) energy-dispersive X-ray spectroscopy (EDX), and (5) superconducting quantum interference device (SQUID) were used in order to gain in-depth insight into the remarkable material properties which confer Raney Ni exceptional durability in the processes. The bulk properties of Raney Ni, were more affected by the dehydrogenation process, presenting significant changes, such as fragmentation of the particles, leaching, and loss of the magnetic properties. The catalyst surface was highly affected by both processes, leading to a decrease in the surface area, the formation of a thin film of organic material on the catalyst surface, and the modification of the chemical composition. Notably, Raney Ni could be regenerated by a simple reactivation treatment (i.e., cooking the catalyst in 2-propanol at 180-200°C) or the stability was improved by the mixing of the solvents. The chemical and physical changes of the surface show distinguishing features that are associated with the changes in selectivity observed in the processes. More recently storage studies of this catalyst in a different solvent have shown the effects of time and different solvents functional groups on the Raney Ni proprieties.



CV: Dr. Jorge A. Mendes-Burak
Born in Brazil, Jorge graduated in Chemistry (BSc) from the State University of Maringá in 2012. His undergraduate research was in the field of biodiesel production using alternative raw materials as micro algae oil by homogeneous and heterogeneous catalysis. In 2014 he finished his MSc in chemical engineering and development of chemical processes at the Federal University of São Carlos, with the project: Steam Reforming of Acetic Acid over Ni/Al_2O_3 catalyst, studies of reactions routes. He then joined the Max Planck Institute Kohlenforschung in Germany, where he obtained his PhD degree in 2017 focused on Raney Ni stability and characterization under different systems. At the moment he is a Postdoctoral researcher in the same institute performing operando studies on Raney Ni aging by XAS and XRD.