

HYDRODEOXYGENATION AND HYDROGENOLYSIS OF BIOMASS-DERIVED PRODUCTS USING MAGNETIC INDUCTION

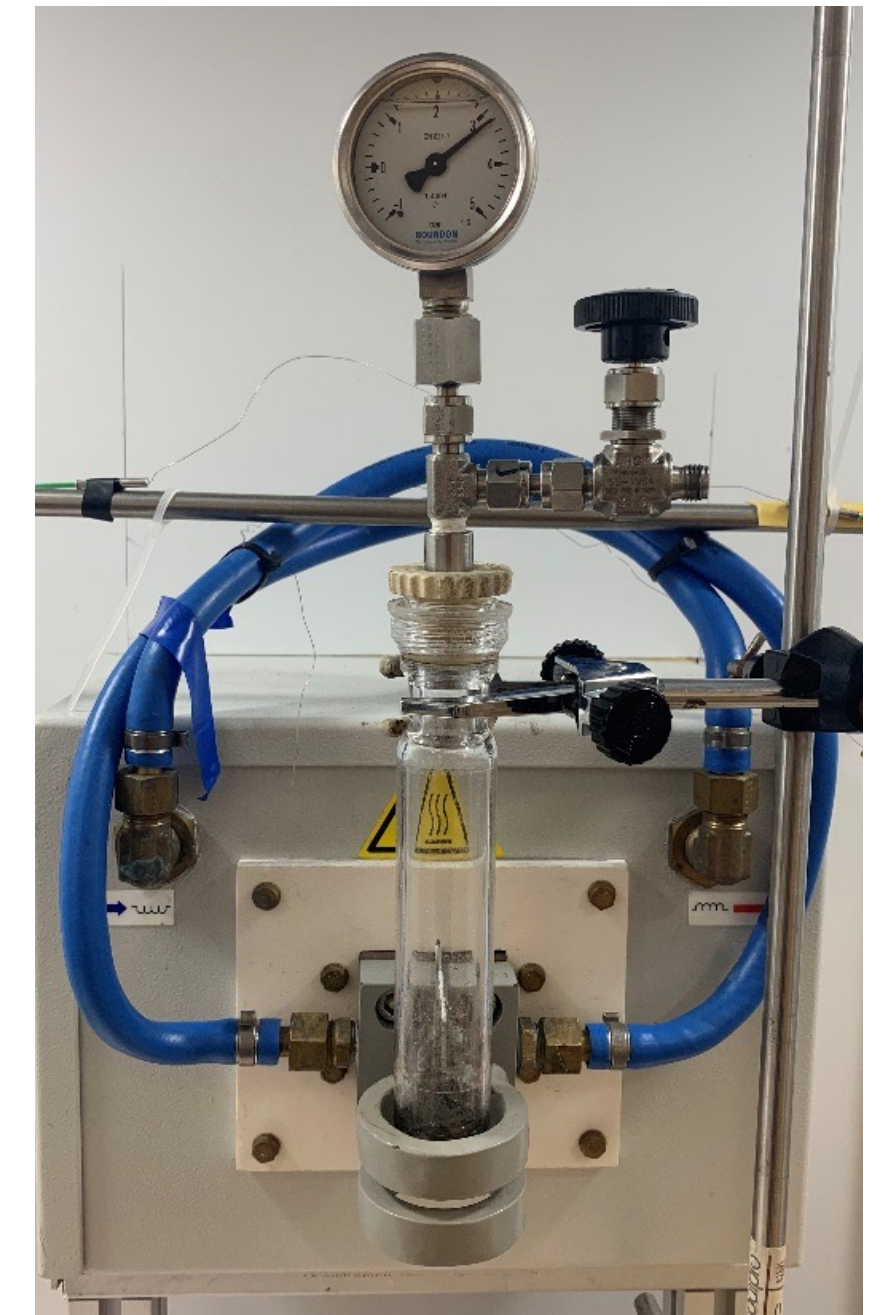
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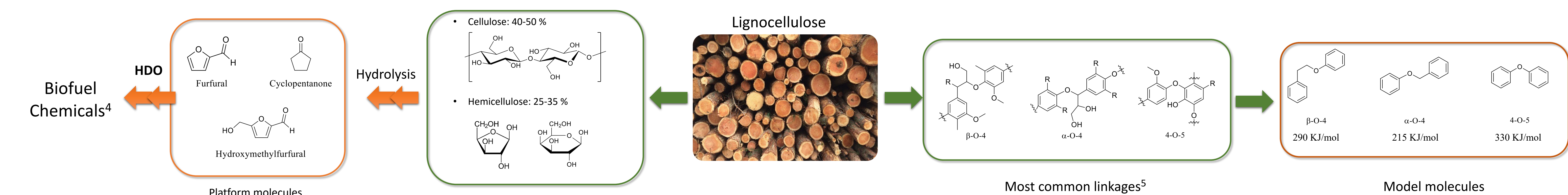
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Introduction

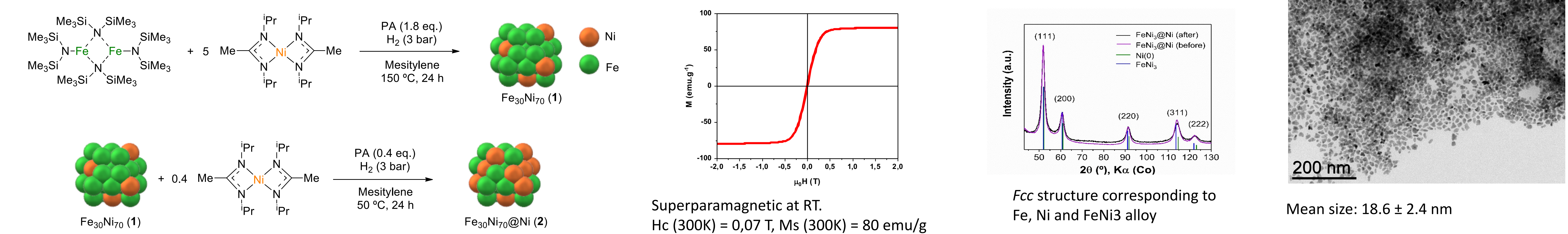
Magnetic-induced catalysis is based on the property of ferromagnetic materials to release heat when they are exposed to an alternating magnetic field. At the LPCNO, the synthesis of magnetic nanoparticles (NPs) is optimized to obtain the best heating properties. In these systems the response to the magnetic field is immediate, and high local temperatures are achieved at the surface of the NPs. They can also display good catalytic activity, as in the case of FeNi₃ NPs, which can act as magnetic heating agents and catalytic species at the same time.¹ Ni-decorated FeNi₃ NPs, FeNi₃@Ni NPs, have demonstrated to catalyze the C-O bond activation in the Sabatier reaction (solid-gas phase). In this work, we present the catalytic properties of FeNi₃@Ni NPs in the hydrodeoxygenation (HDO) and hydrogenolysis of biomass-derived molecules and model molecules. These reactions, reported in the literature to be performed at harsh conditions (50 bar H₂, 200 °C),² are successfully performed in mild conditions thanks to the magnetically-induced catalysis.³



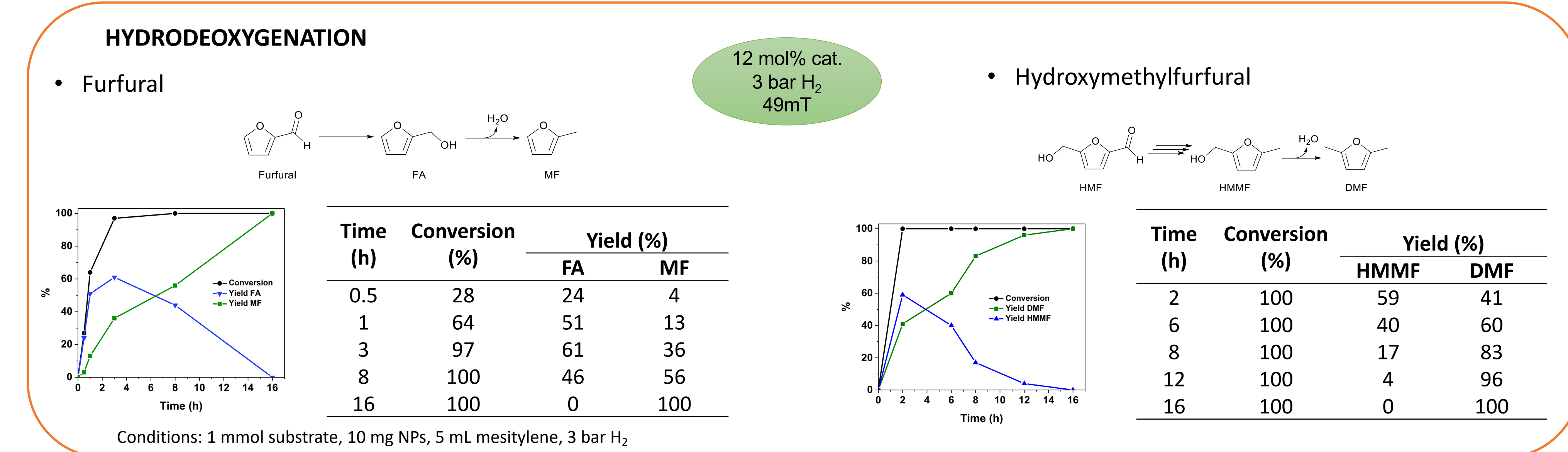
Choice of substrates



Synthesis and characterization



Catalytic reactions



Advantages

- Fast increase of the temperature
- Easy turn on/off
- Very small overpressure
- High local temperatures and pressures
- Mild conditions

Conclusions

FeNi₃@Ni NPs present high magnetic heating properties at low magnetic fields (soft material). It is a versatile catalyst active in the C-O cleavage of different carbonyl groups. Even though no noble metal is present, these reactions can take place in mild conditions and without high overpressures, thanks to the magnetically induced catalysis.

References

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