SYNTHESIS OF NANOCATALYSTS FOR THE CO HYDROGENATION TO FUELS

Vilma Heczko, Aron Jagielski, Pedro Muñoz Rodríguez, Paul Brasseur, Pedro H. C. Camargo
Department of Chemistry, University of Helsinki, Finland

INTRODUCTION

- 4AirCRAFT is aimed at converting recycled CO_2 into sustainable liquid fuels for the aviation sector
- 4AirCRAFT is targeting to convert CO_2 to C_8-C_{16} under milder conditions as compared to conventional catalytic routes [1]
- In one of the proposed strategies, CO_2 is first converted into CO, which is then employed as starting material to long-chain hydrocarbons via FTS
- The goal of our team is to develop inorganic nanocatalysts for the conversion of CO to C_8-C_{16} molecules (fuels)

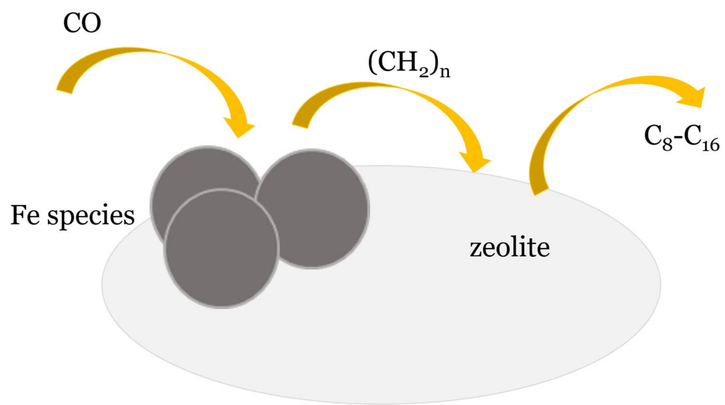


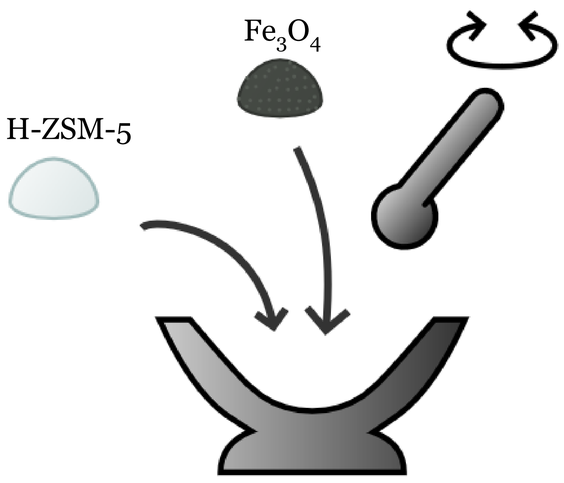
Fig. 1. Scheme of the bifunctional nanocatalyst

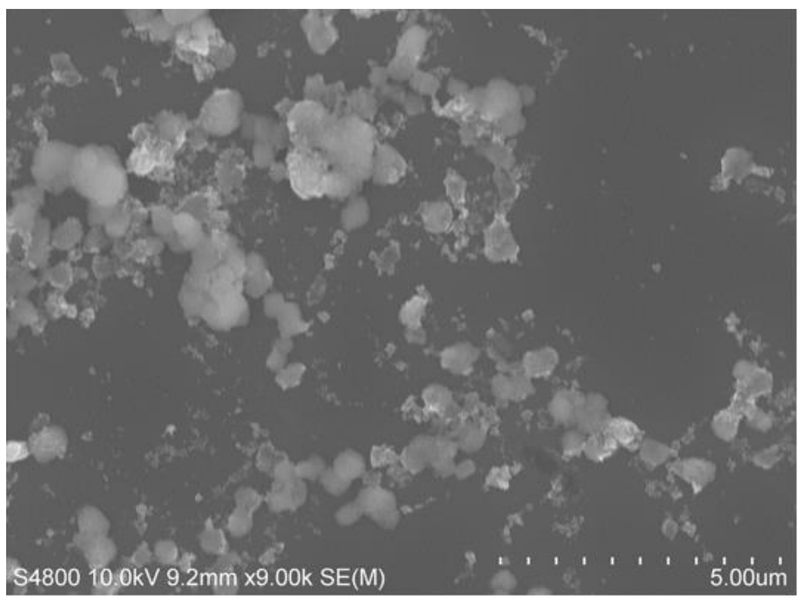
OBJECTIVES

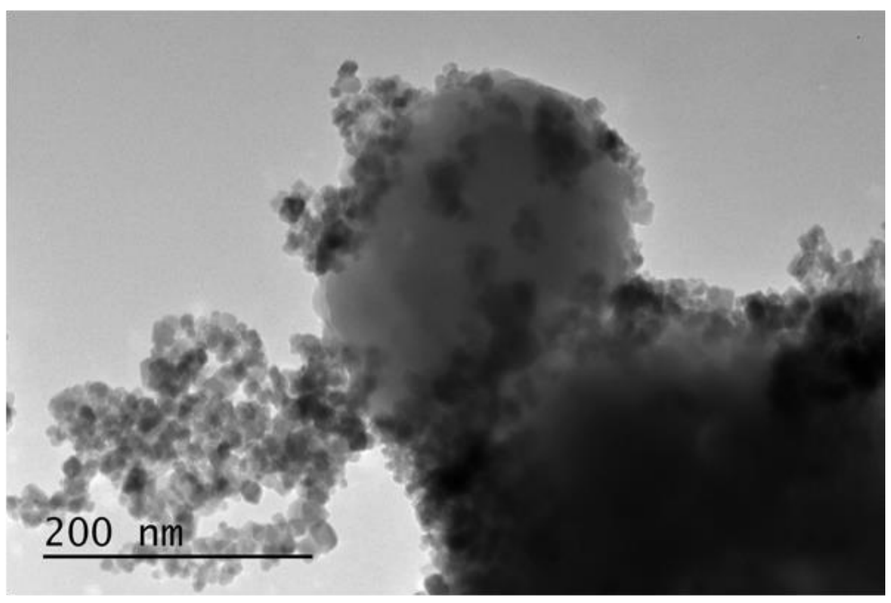
- Develop bifunctional nanocatalysts comprising NPs based on Fe species and zeolites (Fig. 1)
- Investigate the role of the synthesis and Al/Si ratio in the zeolite over catalytic activity and reaction selectivity towards C_8-C_{16} molecules

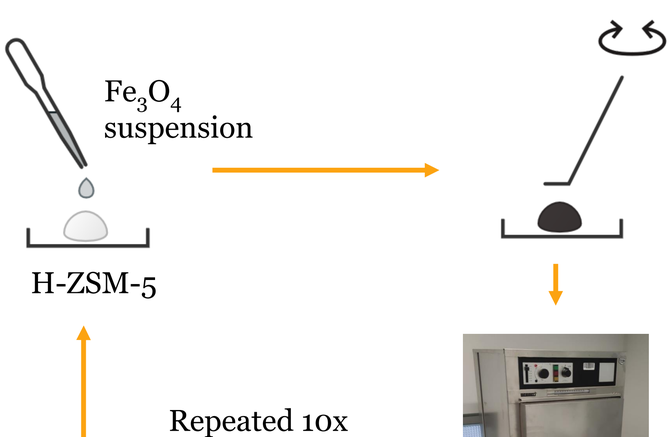
RESULTS AND DISCUSSION

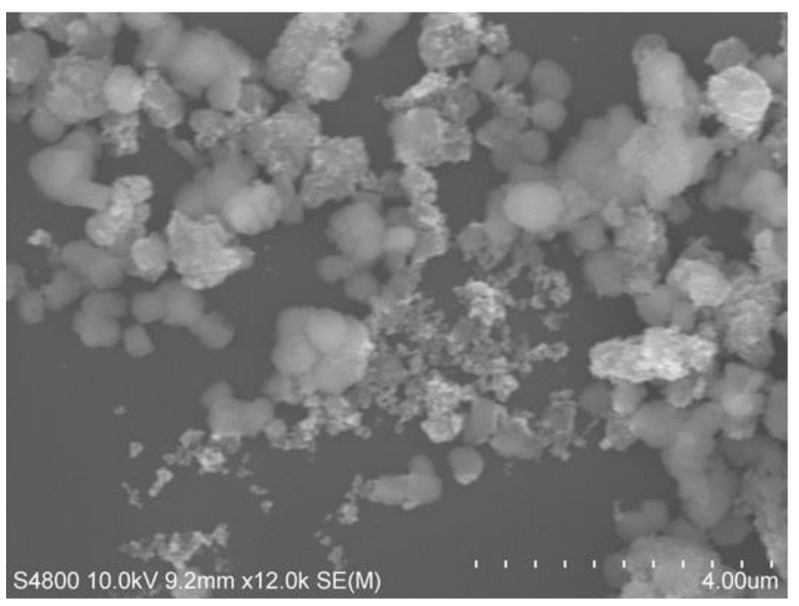
- We started by focusing on H-ZSM-5 as the zeolite and Fe_3O_4 NPs as the Fe component [2]
- We focused on three synthesis strategies: 1) physical mixture, 2) impregnation of pre-formed Fe_3O_4 NPs, and 3) solution impregnation

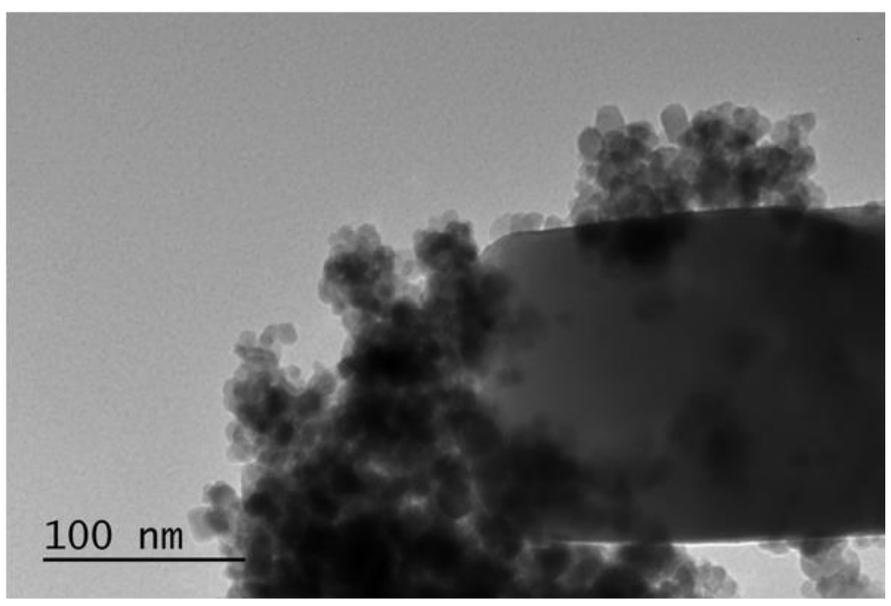


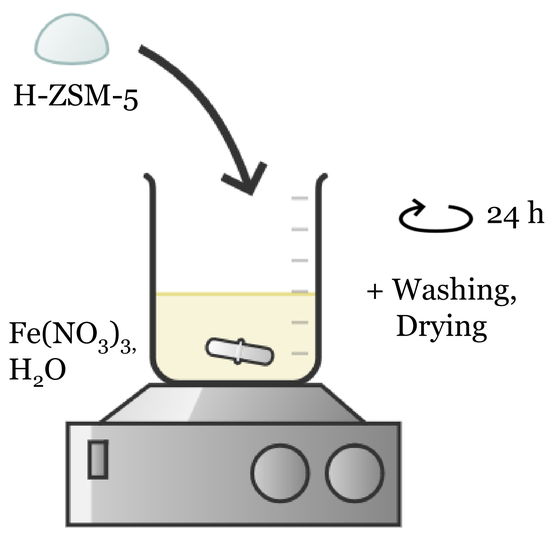


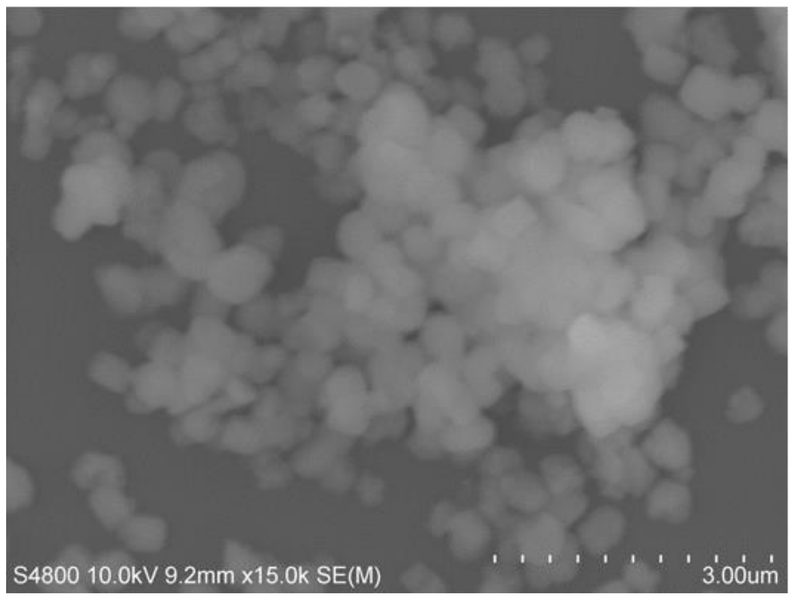












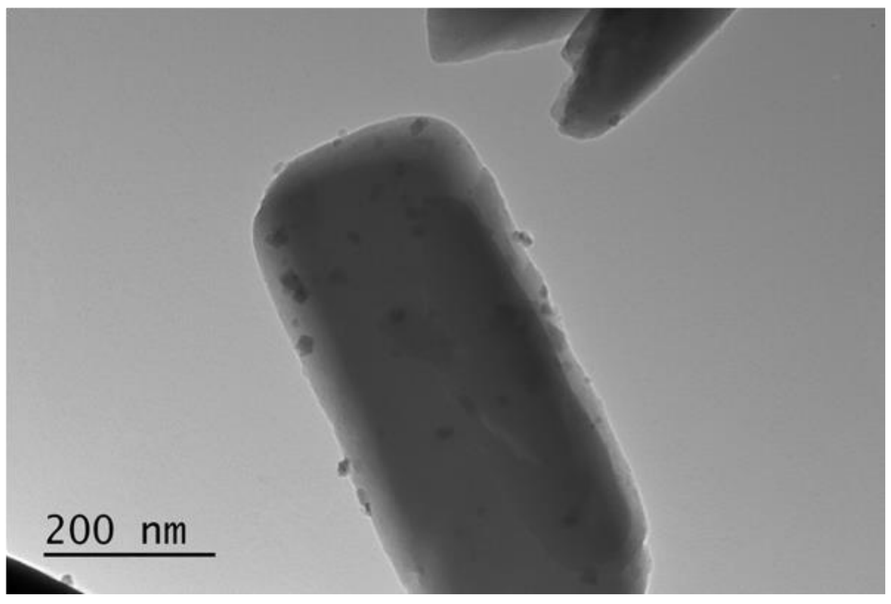


Fig. 2. Preparation method (left column), SEM (middle column) and TEM (right column) images of prepared catalysts

CONCLUSIONS

- Physical mixture and impregnation of pre-formed Fe_3O_4 NPs lead to aggregation of NPs, which becomes mixed with H-ZSM-5
- Solution impregnation leads to a more uniform dispersion of Fe-based components
- Further characterization and catalytic assessment is in progress

References:
[1] 4AirCRAFT - https://4aircraft-project.eu/. Accessed 29.4.2022; [2] J. Wei et al. Nat. Commun. 8, 15174 (2017)

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