Decarbonizing H_2 Production in the Green Transition

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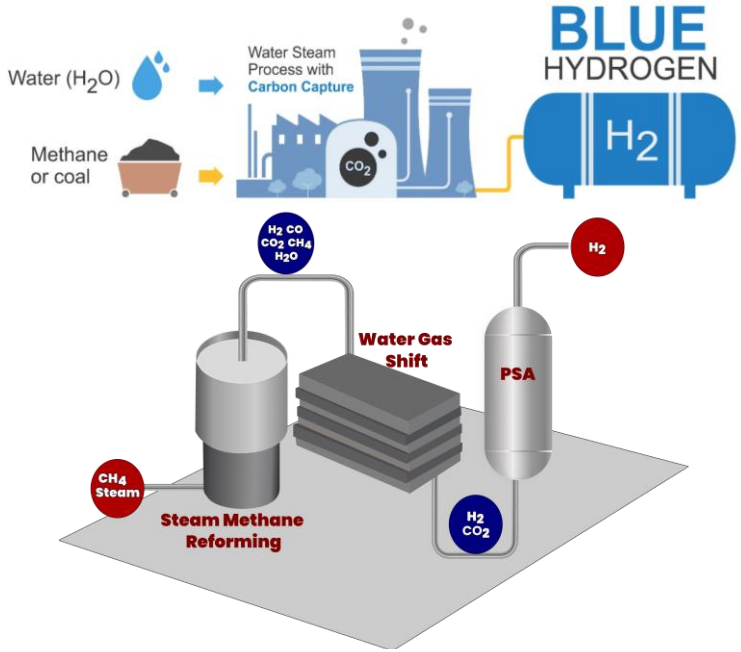
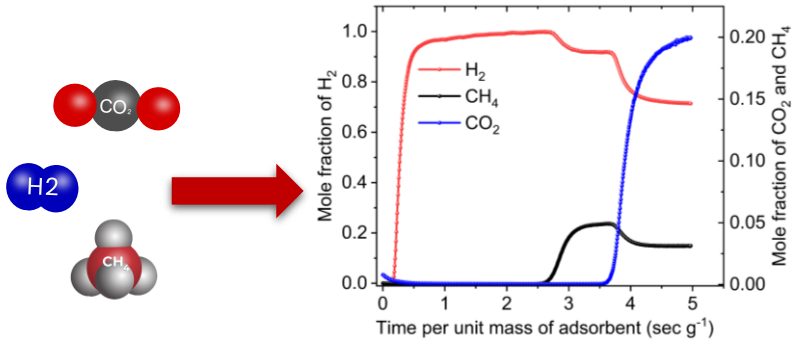
Introduction

Global hydrogen is produced mainly from natural gas without carbon capture, resulting substantial CO_2 emissions that contribute to global warming. Steam Methane Reforming (SMR) with water gas shift which is the main process of H_2 production from natural gas, yields a product composition of 76% H_2, 20% CO_2, and 4% CH_4 excluding the impurities [1]. It is essential to capture and store the produced CO_2 to produce blue hydrogen while delivering H_2 at the highest recovery and purity with minimal energy input as an interim solution until the green transition reaches a significant level [2]. Functionalized Metal-Organic Frameworks, which have demonstrated enhanced CO_2 separation performance for flue gas [3] can also be effectively utilized for H_2 purification.

The future perspectives include enhancing the affinity of adsorbent materials for CO_2 to improve selectivity with better adsorption capacity and improving the material stability towards water and impurities.





Primary objective

- Investigating the potential of porous materials in gas separation.

Secondary objectives

- Developing PSA, TSA, and absorption-based systems using porous materials for carbon capture minimizing the drawbacks in current technologies.
- Purification and separation of gases such as hydrogen using the developed method.

Project: New Porous Liquids for Gas Separation and Carbon Capture.

Funded by Norwegian Research Council.

Estimated progress of the PhD project:

Just started ...	< 50 %	> 50 %	Almost done ☺
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Reference

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3. J. S. R. Fernando, S. S. Asaithambi, S. M. Chavan, Chempluschem 2024, 89, e202400107.

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