Session of "Fokus Materialchemie" – Wednesday, **21.01.2026** 14:00
@ Seminarraum BA 05 (TU-Wien, Getreidemarkt 9, BA, OG. 05, BA05G02)
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Exploring MoS_2-support interactions for catalytic methanol synthesis from CO_2

T. Wagner[1], G.A.S. Alves[1], K. Föttinger[1]

Email: tobias.e165-01-4.wagner@tuwien.ac.at

[1]Institute of Materials Chemistry, TU Wien, Austria

Over the last decades, methanol synthesis has been mainly performed via catalytic syngas-conversion with Cu-based catalysts. Recently methanol formation via CO_2-hydrogenation has been attracting attention, due to the growing interest in using industrial waste gas and biogenic feedstocks. While the conventional reaction is performed with highly purified syngas, the alternative carbon sources are more challenging for the Cu-based catalysts, due to their intolerance to the higher contents of sulfur, which results in further research of more stable and versatile catalysts. In this context, a promising material for CO_2-hydrogenation to methanol is MoS_2, which is expected to tolerate sulfur impurities.

While the pure material of bulk MoS_2 is already known to produce methane, many different effects of promotors, supporting materials and other modification techniques were observed to change the properties of MoS_2 resulting in higher conversions and better selectivity towards methanol [1], [2], [3]. In this work the effects of MoS_2-support interactions are investigated by varying the support material and the MoS_2 loading during the synthesis of the material. The catalysts are compared by their activity in terms of methanol formation in the CO_2-hydrogenation reaction and further characterized by XRD, XPS and SEM.

[1] Huang F. et al. (2025): "Design and recent advances of novel MoS_2-based catalysts for methanol from carbon dioxide hydrogenation". URL: https://doi.org/10.1016/j.seppur.2025.132681. [Date of access: September 29th, 2025]

[2] Zhou S. et al. (2023): "Strained few-layer MoS_2 with atomic copper and selectively exposed in-plane sulfur vacancies for CO_2 hydrogenation to methanol". URL: https://doi.org/10.1038/s41467-023-41362-y. [Date of access: September 29th, 2025]

[3] Hu J. et al. (2021): "Sulfur vacancy-rich MoS_2 as a catalyst for the hydrogenation of CO_2 to methanol". URL: https://doi.org/10.1038/s41929-021-00584-3. [Date of access: September 29th, 2025]