Protection of Methanol Synthesized From Methane via The Formation of Asymmetric Ethers

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Methane is a potent greenhouse gas with a 100 year global warming potential (GWP) 28-34 times greater than that of carbon dioxide.[1] Due to there not being a small- to medium-scale process for the conversion of methane to a more transportable value-added product, the extraction of oil at remote and decentralized locations often necessitates the flaring of methane, where it emerges as an associated gas.[2] A process which may selectively convert methane into a more easily transportable product is based on both the necessity to address the environmental impact of flaring, as well as the economic loss created by it.[3]

An unfavorable conversion-selectivity limit is imposed on the selective partial oxidation of methane to methanol.[4] This is caused by the weaker C-H bond of methanol in comparison to methane, causing it to be more readily oxidized under the conditions necessary to activate methane.[5] This necessitates a strategy to protect methanol from subsequent oxidation.

A tandem reaction, wherein methane is initially converted into methanol, with a consecutive conversion into a more oxidation resistant asymmetric ether would present such a pathway. Such a process would not only be a viable protection strategy for methanol from subsequent oxidation, but could also present a new pathway toward the synthesis of asymmetric ethers.

[1] "The Challenge | UNECE," can be found under https://unece.org/challenge
[2] C. D. Elvidge, M. Zhizhin, K. Baugh, F.-C. Hsu, T. Ghosh, *Energies (Basel)* **2016**, *9*, 14.
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