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Storage of CO₂ in CH₄ hydrate reservoirs: A win-win situation with option for zero emission cycle through conversion of CH₄ to hydrogen and CO₂

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Natural gas hydrates are crystalline structures of water and CH₄, containing up to 14% CH₄. These hydrate structures are distributed all over the world in permafrost regions or in deep offshore sediments and may contain as much as twice the amounts of all other known reserves of conventional fossil fuels. CO₂ hydrate is more stable than CH₄ hydrate over most regions of temperature and pressure and mixed hydrate in which CH₄ fills part of the structure (the 25% small cavities in the structure) is more stable than CH₄ hydrate over all conditions of temperature and pressure. Injection of CO₂ into natural gas hydrates will therefore lead to release of CH₄ for energy while at the same time storing CO₂ in solid form. Steam cracking of the produced CH₄ over to hydrogen and CO₂ gives the option of a zero-emission cycle for producing energy. Experiments, as well as theoretical aspects of the concept are discussed in detail. Technical solutions for the various stages of the cycle is also presented and discussed. Special focus is on the various mechanisms for the conversions and how to optimize the concept.

Biography

Bjørn Kvamme has obtained his MSc in Chemical Engineering (1981) and PhD in Chemical Engineering (1984) from the Norwegian University of Technology and Natural Sciences. After a short period with SINTEF and two years at Bergen University College, he was appointed as Full Professor in 1987 and started education of MSc and PhD in Process Technology in Telemark. He is appointed as a Professor in Gas Processing at the Department of Physics, University of Bergen in March 2000. He is the author/co-author of 445 publications during last 15 years, of which 154 are in good international scientific journals. He has 2526 citations as per Feb 1, 2018 and has presented numerous papers at international conferences.

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