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Why a thermodynamic approach for CO_2 disposal and H_2 or CH_4 extraction from marine gas hydrate deposits

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Abstract: If 1% of the methane in gas hydrate deposits escapes to the atmosphere, global warming will become catastrophic, but H_2 or methane can be extracted from hydrates with reliable CO_2 burial in quantities that make the extracted fuel the only energy source with a significant negative carbon footprint in the atmosphere. The analysis of the problems registered during the test extraction of methane from hydrates which stop the development of efficient technologies for the exploitation of both permafrost and marine gas hydrate deposits, proves the failure of the simplified approach based on equilibrium P-T phase curves supported by laboratory experiments. They are also the basis for wrong conclusions about gas hydrates in the Black Sea, as unpromising for the extraction of CH_4 by its replacement in the hydrate with CO_2, due to the high temperature of the deep-sea bottom of 9 °C. The consistent application of a thermodynamic approach shows the injection of which gas mixtures make it possible the exothermic process from the formation of CO_2-hydrate to release CH_4, and the Gibbs energy analysis proves the high stability of the newly formed hydrate. The released gas can be converted to H_2 and CO_2 using steam, a standard process first patented by Norsk Hydro in 1913.

Защо термодинамичен подход за погребване на CO_2 и добив на CH_4 и/или H_2 от морски газхидратни находища

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