

Methane gas as a renewable energy: Sustainable hydrocarbon energy resources development by carbon recycling CCS

KOIDE, Hitoshi^{1*}

¹National Institute of Advanced Industrial Science and Technology (AIST)

From a commonsense standpoint, methane gas is a kind of fossil fuel that is a limited energy resource. It is believed that the underground methane was generated mostly by thermal decomposition of oil, coal or other organic matter - fossil. However, large amounts of habitat of methanogens (archaea) have been found recently in wide range of underground environments. Many types of methanogens produce methane from organic acids which are also fossil origin. However, CO₂-reducer methanogens produce methane from hydrogen and CO₂ which may be derived from the mantle or hydrothermal reaction in deep rocks instead of the direct seepage of deep methane in the unproven Thomas Gold hypothesis (abiogenic petroleum origin). Methane produced from abiogenic deep CO₂ and hydrogen predominant in deep igneous rocks and in basaltic oceanic crust is not a fossil energy resource but a renewable energy resource. In particular, the methane hydrate in deep oceanic crust is a renewable energy resource.

The stored CO₂ in underground reservoirs by the CO₂ capture and storage (CCS) will be converted into methane by the underground CO₂-reducer methanogens. Then, the converted methane will be available as a renewable energy while CO₂ emission into the atmosphere is suppressed. The sustainable hydrocarbon energy development becomes reality by the worldwide systematic deployment of this CO₂-recycling CCS.

Keywords: CCS, carbon recycling, renewable energy, methanogen, fossil energy, methane hydrate