

Methane oxidation under mild conditions

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The selective oxidation of methane into methane oxygenates including methanol, formaldehyde, and formic acid has been a challenging topic in chemistry. Although high yields of methanol precursor have been reported, all of them should be carried out in strong acids such as sulfuric acid or trifluoroacetic acid. Recently, new catalyst systems composed of supported Pd catalysts and Fe²⁺/Fe³⁺ homogeneous catalyst system pair was successfully applied to methane oxidation under mild conditions. In this system, the active hydroxyl radical can be produced via well-known Fenton chemistry and used to activate the strong C-H bond in methane. the metallic Pd is essential to produce hydrogen peroxide from hydrogen and oxygen as well as to reduce Fe³⁺ into Fe²⁺ in the presence of hydrogen in order to complete the catalytic cycle for this reaction. Finally, the biomimetic system can be proposed to oxidize methane into methane oxygenates under mild conditions with oxygen and hydrogen as a reducing agent.