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For sustainable development of the whole world by renewable energy

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Abstract:

The atmospheric carbon dioxide concentration increased with industrial development. After 1970 it increased with incrasing rate and now exceeded 400 ppm corresponding to the level in 3.5 million years ago, in spite of the fact that our Homo Sapiens appeared only 200,000 years ago. The world average temperature increased 0.26°C for 10 years since 2007. There is no solution to avoid global warming as far as we burn fossil fuel. Extrapolation of recent increase in the world primary energy consumption indicates that all reserves of fossil fuels and uranium will be completely exhausted until the middle of this century. In order to avoid the crisis of intolerable global warming and no fuels for combustion we have to establish and spread the technologies by which the whole world can keep sustainable development only using renewable energy.

We are studying for about 30 years to supply renewable energy to the world in the form of synthesized natural gas methane by electrolytic hydrogen generation and subsequent methane formation from hydrogen and captured carbon dioxide. We created necessary key materials. Those are anodes and cathodes for water electrolysis and catalysts for carbon dioxide methanation. We constructed a prototype plant consisting of solar cell, water electrolyzer, carbon dioxide methanation unit, methane combustor with oxygen and piping connecting methane production and combustion units in 1995. Industrial plants are available.

There are superabundant renewable energy sources on our planet, and we have a variety of power generation systems. The major sources are solar and wind powers characterized by intermittent and fluctuating nature. For the use of only renewable energy we need to store the surplus electricity by which we make up for a deficiency of intermittent power. The most convenient and easily applicable technology to store the surplus electricity is the formation of methane. If we regenerate steady electricity from methane the whole world can keep the sustainable development only by renewable energy.

Biography:

Koji Hashimoto is a Professor Emeritus of Tohoku University (Institute for Materials Research) and Professor Emeritus of Tohoku Institute of Technology, Japan. He has been working for 30 years for the supply of renewable energy in the form of methane to the world by electrolytic hydrogen production and subsequent methane formation by the reaction of carbon dioxide with hydrogen. He has published more than 560 papers and received various international awards mostly from Electrochemical Society and NACE International.