Storage of Renewable Energy in Synthetic Fuels

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The world wide energy demand increases just as rapidly as the average temperature of the atmosphere. The reserves of fossil fuels worldwide are limited and the combustion of the carbon fuels leads to a severe increase of the CO_2 concentration in the atmosphere. The latter is responsible for the climate change. The future of the industrialized word, i.e. the economy as well as the society, is determined by the ability to change from fossil fuels as energy carriers to renewable energy. The main difference between the fossil period and the future is the requirement of producing synthetic energy carriers.

Hydrogen as an energy carrier opens the path to a society based on renewable energy. The storage of hydrogen in metals and complex hydrides as stable compounds offers a great volumetric storage density, however the gravimetric storage density is limited to less than 20mass% in the materials. In order to replace fossil fuels without scarification on energy density synthetic fuels based on hydrogen e.g. NH_3 or C_8H_{18} have to be developed [1]. The latter also represents a effective CO_2 sink for the atmosphere.

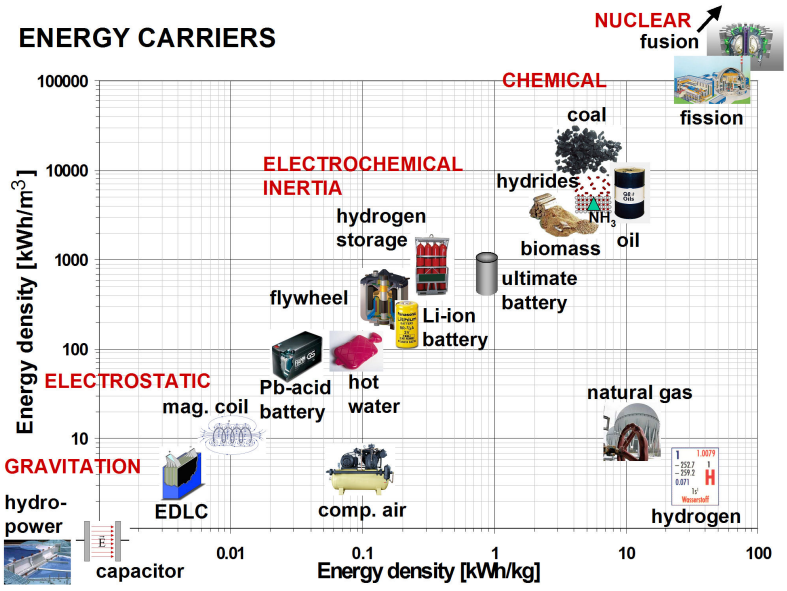

Fig. 1: Volumetric vs. gravimetric energy density of important energy carriers.

References

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