

Sustainable energy storage in chemical fuels for CO₂ neutral energy generation: a plasma perspective



**Richard
VAN DE SANDEN**

Dutch Institute for
Fundamental Energy Research

**lundi
11 février 2013**

École Polytechnique
Amphi. Becquerel
14h

Département de Mécanique

Sustainable energy generation by means of wind or from solar radiation through photovoltaic conversion or concentrated solar power will be certainly a significant part of the energy mix in 2025. The intermittency (day/night cycle) as well as the regional variation of these energy sources, however, requires a means to store and transport energy on a large scale.

In this presentation I will address the research FOM-DIFFER will initiate on the storage of sustainable energy in fuels. These so-called solar fuels, e.g. hydrocarbons and alcohols, by means of *artificial photosynthesis* using CO₂ and H₂O as raw materials and sustainable energy by wind or sun, will enable a CO₂ neutral power generation infrastructure, which is close to the present infrastructure based on fossil fuels. Basically, the challenge will be to achieve *power efficient* dissociation of CO₂ or H₂O or both, after which traditional chemical conversion (Fisher-Tropsch, Sabatier, etc.) towards fuels can take place.

Most of the research efforts globally are directed at the splitting of water in hydrogen and oxygen, as no efficient (photo-)catalytic or traditional chemical alternative for CO₂ is yet available. A promising route could be the power efficient dissociation or activation of CO₂ gas streams by means of plasma, possible enhanced with plasma assisted catalysis.

Taking the advantage of non-equilibrium plasma conditions to reach optimal energy efficiency the FOM institute DIFFER has started part of its solar fuels program focusing on CO₂ fed microwave plasmas. The plasma is generated in a low loss microwave cavity with microwave powers up to 10kW using a supersonic expansion to quench the plasma and prevent vibrational-translational relaxation losses. Recent results from a collaboration with IPF Stuttgart will be presented.



<http://www.coriolis.polytechnique.fr>