

Fuel production by solar concentrating technologies

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Solar radiation is the largest indigenous energy resource worldwide. It will gain a significantly more relevant role in covering the energy demand of many countries when national fuel reserves fall short and when demand increases as is expected within the next 10 years. If solar energy is transformed into heat by concentrating and absorbing the radiation, energy can be stored easily. Thermal energy from mirror fields that focus solar radiation not only is able to generate electricity but also can be used to generate storable heat, to desalinate salt water or to synthesise fuels from water and carbon dioxide and other feedstocks to store, transport or use them on-site.

The aim of the present contribution is to give an overview on the state-of-the art of technologies for solarthermal fuel production. The contribution presents the development and current status of solar water and carbon dioxide splitting and solar aided reforming reactions, focussing in particular on the reactor technologies and concepts employed so far to couple the heat requirements of the reactions involved to the underlying principles, intricacies and peculiarities of Concentrated Solar Power (CSP) exploitation. A thorough review is presented, addressing practically the whole scale of solar reactors employed so far: from small-scale reactor prototypes often tested under simulated solar irradiation up to scaled-up reformer reactors tested on solar platform sites at the level of few hundreds of kilowatts.

Keywords: solar fuels, water splitting, concentrated solar radiation, solar towers, hydrogen