Sustainable chemical processing and energy-carbon dioxide management: review of challenges and opportunities - DTU Orbit (08/11/2019)

**Sustainable chemical processing and energy-carbon dioxide management: review of challenges and opportunities**

This paper presents a brief review of the available energy sources for consumption, their effects in terms of CO2-emission and its management, and sustainable chemical processing where energy-consumption, CO2-emission, as well as economics and environmental impacts are considered. Not all available energy sources are being utilized efficiently, while, the energy source causing the largest emission of CO2 is being used in the largest amount. The CO2 management is therefore looking at "curing" the problem rather than "preventing" it. Examples highlighting the synthesis, design and analysis of sustainable chemical processing in the utilization of biomass-based energy-chemicals production, carbon-capture and utilization with zero or negative CO2-emission to produce value added chemicals as well as retrofit design of energy intensive chemical processes with significant reduction of energy consumption are presented. These examples highlight issues of energy sustainable design, energy-CO2 neutral design, energy-retrofit design, and energy-process intensification. Finally, some perspectives on the status and future directions of carbon dioxide management are given.

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