Toward the Development and Deployment of Large-Scale Carbon Dioxide Capture and
Conversion Processes - DTU Orbit (24/12/2018)

In light of the depletion of fossil fuels and the increased daily requirements for liquid fuels and chemicals, CO2 should indeed be regarded as a valuable C-1. additional feedstock for sustainable manufacturing of liquid fuels and chemicals. Development and deployment of CO2 capture and chemical conversion processes are among the grand challenges faced by today's scientists and engineers. Very few of the reported CO2 capture and conversion technologies have been employed for industrial installations on a large scale, where high-efficiency, cost/energy-effectiveness, and environmental friendliness are three keys factors. The CO2 capture technologies from stationary sources and ambient air based on solvents, solid sorbents, and membranes are discussed first. Transforming CO2 to liquid fuels and chemicals, which are presently produced from petroleum, through thermochemical, electrochemical, photochemical, and biochemical routes are discussed next. The relevant state-of-the-art computational methods and tools as a complement to experiments are also briefly discussed. Finally, after pointing out the advantages and disadvantages of the currently available technologies for CO2 capture and conversion, ideas and perspectives for the development of new techniques, opportunities, and challenges are highlighted.