CO_2 Capture Technologies to Combat Climate Change

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INTRODUCTION

The majority of scientists, politicians, and organizations agree that climate change is one of the biggest challenges for the 21st century. While not all factors affecting the earth climate are known, the climate change is partly attributed to anthropogenic emissions of carbon dioxide and other greenhouse gases, which are projected to increase due to e.g. the economical growth and the associated increase in energy consumption. The climate models used by International Panel on Climate Change (IPCC) predict an increase in global mean temperatures due to an increase in the concentration of greenhouse gases in the atmosphere. At an estimated increase of 130% in atmospheric carbon dioxide by year 2050, the models predict an increase in the global average temperature to increase by 6°C. The social and environmental consequences of global warming of this extent may become cataclysmic, and must be prevented through a global effort to reduce the CO_2 emissions. This is a huge challenge as economic growth and increasing population increase the global energy requirements.

COMBATING CLIMATE CHANGE

Reducing the CO_2 emissions requires immense efforts in many areas, including e.g. improving energy efficiency of buildings, the transportation sector, industry, and most importantly, the power sector. But improvements in energy efficiencies are not enough and Carbon Capture and Storage (CCS), where CO_2 is captured from the flue gas of power plants and then stored in geological structures must be applied on a massive scale to reduce the global CO_2 emissions. When CO_2 is captured from power plants using sustainably produced biomass (i.e. that the biomass is burned at a rate equal to or lower than the growth rate), CO_2 is effectively captured from the atmosphere and thereby combating climate change by reducing the atmospheric CO_2 concentration.

CARBON CAPTURE TECHNOLOGIES

The two carbon capture technologies that are ready to be implemented on a massive scale are “Oxyfuel Combustion” and “Post-Combustion” CO_2 capture using solvents. Results of experimental investigations of the oxyfuel combustion process and thermodynamic calculations on the post-combustion capture processes are presented, and the potential of implementing these technologies on existing and new power plants is discussed. The poster summarizes the investigations done by the author since primo 2009 related to carbon capture technologies that can be applied in the near future.