Akan, P., Ruiz Salmón, I., Luis, P. Life cycle assessment of CO2 capture for further reuse as sodium carbonate. 6th Eur. Conf. Ren. Energy Sys. 25-27 June 2018, Istanbul, Turkey

Abstract:

The most important cause of the increase in the carbon dioxide (CO_2) concentration in the atmosphere is shown as thermal power plants using fossil fuels. In order to avoid global warming, it is very important to separate CO_2 from gas mixtures in the flue gas of these facilities. To capture CO_2 from a gas stream via membrane technology is a promising alternative to conventional techniques, such as absorption towers, where several operation problems take place, such as flooding, foaming, channeling and entrainment. In this study, the environmental impact of the chemical absorption of CO_2 with aqueous NaOH through two technologies including a packed absorption column and a membrane contactor was evaluated by Life Cycle Assessment (LCA). LCA approach was implemented with the commercial software SimaPro 8.3 by using ReCiPe Endpoint (H) method. Life cycle impact categories were examined and assessed supposing a functional unit of 1kgCO_2/h treated (entering the system) and employing the life cycle inventory data from the Ecoinvent v3.1 database. Life Cycle Impact Assessment (LCIA) was carried out for 6 categories: climate change, ozone depletion, human toxicity, photochemical oxidant formation, particulate matter formation, ionizing radiation. Simulation results of two technologies for all impact categories revealed that the environmental impact increases with the increase of solvent concentration and membrane contactor has higher environmental impact due to its lower CO_2 removal efficiency compared to packed absorption column. Moreover, climate change has the highest impact among other impact categories for both gas absorption column and membrane contactor due to the production of sodium hydroxide.