

New solutions for CO₂ capture: use of Molten Carbonate Fuel Cells by retrofitting existing plants

Nicola di Giulio^{1,2}, Angelo Moreno¹, 한종희², 남석우^{2,*}

¹ENEA; ²KIST
(swn@kist.re.kr*)

Post-combustion CO₂ capture technologies applied on combustion exhaust from thermoelectric plants, besides having the advantage of being easily installable on existing plants and technologically mature, have the great disadvantage of causing higher energy penalization (about 10%). This penalization is tied to the low values of CO₂ concentration in the exhaust which, as in the case of gas turbines, are about 3–5% mole. This means that there are higher values of exhaust needing treatment and so, if technologies based on amine solvents are used, this equals more solution to regenerate and consequently higher values of thermal power needed for the regenerator. The possibility of decreasing the exhaust needing treatment and at the same time increasing the concentration of CO₂ could scale down the energy burden of capture and also allow amplifying the range of methodologies used to achieve this objective. According to this, MCFCs can be used as CO₂ “concentrators”. This work intends to contribute to laying the foundation for the development of a new application for CO₂ capture utilizing Molten Carbonate Fuel Cells (MCFC), used with existing plants. A basic model for retrofitting a gas turbine with MCFC has been developed and a technical and economical feasibility analysis has been carried out.