



Preliminary Modelling of the Effect of Impurity in CO₂ Streams on the Storage Capacity and the Plume Migration in Pohang Basin, Korea

Yongchan Park, Byoungyoung Choi, and Youngjae Shinn
KIGAM, Daejeon, Korea, Republic Of (ycpark@kigam.re.kr)

Captured CO₂ streams contain various levels of impurities which vary depending on the combustion technology and CO₂ sources such as a power plant and iron and steel production processes. Common impurities or contaminants are non-condensable gases like nitrogen, oxygen and hydrogen, and are also air pollutants like sulphur and nitrogen oxides. Specifically for geological storage, the non-condensable gases in CO₂ streams are not favourable because they can decrease density of the injected CO₂ stream and can affect buoyancy of the plume. However, separation of these impurities to obtain the CO₂ purity higher than 99% would greatly increase the cost of capture. In 2010, the Korean Government announced a national framework to develop CCS, with the aim of developing two large scale integrated CCS projects by 2020. In order to achieve this goal, a small scale injection project into Pohang basin near shoreline has begun which is seeking the connection with a capture project, especially at a steel company. Any onshore sites that are suitable for the geological storage are not identified by this time so we turned to the shallow offshore Pohang basin where is close to a large-scale CO₂ source. Currently, detailed site surveys are being undertaken and the collected data were used to establish a geological model of the basin. In this study, we performed preliminary modelling study on the effect of impurities on the geological storage using the geological model. Using a potential compositions of impurities in CO₂ streams from the steel company, we firstly calculated density and viscosity of CO₂ streams as a function of various pressure and temperature conditions with CMG-WINPROP and then investigated the effect of the non-condensable gases on storage capacity, injectivity and plume migrations with CMG-GEM. Further simulations to evaluate the areal and vertical sweep efficiencies by impurities were perform in a 2D vertical cross section as well as in a 3D simulation grid. Also, pressure increases caused by the impurities and the partitioning between CO₂ and other non-condensable gases were explored. In addition, the possibility of using these contaminants as a tracer were examined.