



Low temperature sulfur dioxide capture using coal fly ash as solid sorbent

Mahinsasa Rathnayake¹, Somnuk Tangtermsirikul² and Pisanu Toochinda^{1*}

¹*School of Bio-Chemical Engineering and Technology, Sirindhorn International Institute of Technology, Thammasat University, Thailand.*

²*School of Civil Engineering and Technology, Sirindhorn International Institute of Technology, Thammasat University, Thailand.*

*e-mail: pisanu@siit.tu.ac.th

Coal fly ash with high free lime can serve as a solid sorbent at low temperatures, to reduce SO₂ emission from coal combustion and lower the load of desulfurization units in coal fired power plants. SO₂ capture of fly ash via adsorption and sulfation reaction was evaluated by temperature programmed desorption mass spectrometry (TPD-MS) and EDTA titration. Reversible SO₂ adsorption on fly ash occurs at low temperatures (50-100 °C) and the activity reduces with temperature increment. However, reversible SO₂ adsorption is not desirable for SO₂ capture. The activity of irreversible SO₂ sulfation on fly ash boosts up at high temperatures (285°C-435°C). Temperature programmed reaction mass spectrometry (TPR-MS) was performed to determine the overall SO₂ capture from 35°C to 600°C. The highest yield (67.3%) of irreversible SO₂ capture was observed around at 400°C which is a lower temperature than the conventional dry flue gas desulfurization temperatures (>700°C). The mechanism of SO₂ capture by fly ash will be discussed.

Keywords: Low temperature SO₂ capture, solid sorbent, coal fly ash