

# **The Effect of Dopant Loading for CO<sub>2</sub> Capture Using MgO/Fe<sub>2</sub>O<sub>3</sub>**

Azizul Hakim Lahuri

Department of Science and Technology, Universiti Putra Malaysia Bintulu Campus, Nyabau Road, P.O. Box 396, 97008 Bintulu, Sarawak, Malaysia., Malaysia

## **Author list (excluding presenting author)**

Nur Farhana Jaafar, Norazzizi Nordin, Norliza Dzakaria, Salma Samidin, Syawal Mohd Yusof, Siti Sarahah Sulhadi, Ainil Hafiza Abdul Aziz

## **Abstract**

Carbon dioxide (CO<sub>2</sub>) adsorption and desorption studies using magnesium oxide (MgO) impregnated on iron oxide (Fe<sub>2</sub>O<sub>3</sub>) to determine the formation and dissociation of carbonate and CO<sub>2</sub> adsorbed species. The adsorbents were prepared by conventional impregnation method. The adsorbents were characterized by using XPS, FTIR and chemisorption. The S-2 sample that calcined at 200 °C exhibited the highest adsorption capacity using temperature-programmed desorption CO<sub>2</sub> (CO<sub>2</sub>-TPD) analysis. The presence of MgO (20 wt. %) on Fe<sub>2</sub>O<sub>3</sub> was confirmed by x-ray photoelectron spectroscopy (XPS) analysis reduce in desorption temperature compared to Fe<sub>2</sub>O<sub>3</sub> alone. The percentage increment in O 1s and C 1s spectra after 24 hours of CO<sub>2</sub> exposure indicated the formation of carbonate on the surfaces. Infrared (IR) spectra dependence on the CO<sub>2</sub>-TPD curve described CO<sub>2</sub> adsorbed product and carbonate formation on the adsorbent. Throughout the desorption curves, species that were removed correlated to their chemical and physical phenomena. CO<sub>2</sub> attached by hydrogen bonding was firstly removed, followed by bending CO<sub>2</sub>, bicarbonate, bidentate carbonate and eventually polydentate carbonate. Meanwhile, the dissociation of asymmetry stretches ( $\nu_3$ ) linear CO<sub>2</sub> depending on its environments and interaction. The second layer of CO<sub>2</sub> that is close to physisorbed CO<sub>2</sub> dissociated at the early of the desorption curve while kernel CO<sub>2</sub> that is nearest to the adsorbent surface requires a higher temperature because it is bound to the metal ions and possesses higher binding energy.

## **Early Career Scientist**

NO, I am not an early career scientist.

## **IGAC Activities**

ACAM: Atmospheric Chemistry and the Asian Monsoon, GEIA: Global Emissions Initiative, AMIGO: Analysis of eMissions usinG Observations

## **IGAC Regional Working Groups**

Southern Hemisphere Working Group, Japan National Committee, MANGO: Monsoon Asia and Oceania Networking Group