***Abstract No: 235*** ***Physical Sciences***

# HYDROTHERMAL SYNTHESIS AND CHARACTERIZATION OF MORDENITE

**M.K.N. Ranasinghe[1*], I.P.L. Jayarathne[2] and W.M.A.T. Bandara[1]**

*[1]Department of Chemistry, Faculty of Science, University of Peradeniya, Peradeniya, Sri Lanka*
*[2]National Institute of Fundamental Studies, Kandy, Sri Lanka*
*[*]rkumu8@gmail.com*

Mordenite is one of the most highly siliceous zeolites, which has an ideal composition of $Na_8Al_8Si_{40}O_{96}.24H_2O$. Mordenite has been used mainly as a catalyst for many industrially important reactions such as alkylation, hydrocracking, hydroisomerization, dewaxing, reforming, and cracking. Mordenite has also been used in the absorptive separation of gas or liquid mixtures, where it is used as a molecular sieve. Even though mordenite occurs as a natural mineral, synthetic mordenite are better suited to meet many of the industrial requirements. Main reasons behind this are its purity and controlled pore structure. In this work, mordenite was synthesized by a hydrothermal synthesis method. Hydrothermal synthesis is commonly used in the synthesis of aluminosilicate zeolites due to its advantages over other methods such as effective solvation ability of water, increased solubility of reactants and increased nucleation. Effect of different parameters in the synthesis of mordenite was investigated by adjusting the gel composition and optimizing parameters such as crystallization temperature (170, 180, 190 and 200 °C), crystallization time (24, 36, 48 and 72 h) and aging time (2, 4 and 8 h). Mordenite was successfully synthesized in the absence of seeds and in the absence of organic templates at 170 °C, 48 h of crystallization time and 4 h of aging of the synthesis mixture. Gel composition of the mixture was $6Na_2O:Al_2O_3:30SiO_2:780H_2O$. Mordenite was also successfully modified with Fe and Zn to get Fe-MOR and Zn-MOR respectively. Modification with iron was done by a solid ion-exchange method using $FeSO_4$ and zinc modification was done by a wet ion-exchange method using a $Zn(NO_3)_2$ solution. The products were characterized using powder X-ray diffraction, Fourier transform infrared spectroscopy, X-ray fluorescence spectroscopy and particle size analyzing techniques. This work demonstrates an eco-friendly method for the synthesis of mordenite under laboratory conditions.

*Financial assistance from the National Institute of Fundamental Studies* (*Grant No. 10-090*) *is acknowledged.*

**Keywords:** Aluminosilicate, Catalyst, Hydrothermal synthesis, Mordenite, Zeolite