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The Effect of Temperature for Structural Changes of Nickel Doped Zeolite

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Abstract:- Nickel doped zeolite NaA was procured form standard material supplier agency. The structural and morphology of the nickel doped zeolite NaA material ware characterized by range of experimental techniques, such as X-ray diffraction, Thermogravimetric and differential thermal analysis. The Nickel doped Zeolite NaA fine Powder were crushed with agate mortar. The effects of temperature for structural changes of nikel doped zeolite were observed that temperature is increased then structural changes are detected.

Keywords:- Zeolite NaA, XRD, TG-DTA, etc.

1. Introduction

Zeolites are three-dimensional, microporous, crystalline solids with well-defined structures that surround aluminium, silicon, and oxygen in their regular framework; cations and water are located in the pores. The silicon and aluminium atoms are tetrahedrally coordinated with each other through shared oxygen atoms. Compositionally, zeolites are similar to clay minerals (W.M. Meier et.al 1999). More specifically, both are alumino-silicates. They differ, however, in their crystalline structure (J. Rouguerol et.al. 1994). Zeolites are divided into two categories: natural and synthesized groups. In the last decade, zeolites have been gaining great attention and proved very useful in a wide range of applications. The natural zeolites are commonly used to remove heavy metal in water and wastewater treatment (E. Erdem 2004). Mostly, the synthesized zeolites are more valuable than the natural one. Zeolites are inorganic crystalline structures of alumino silicates with uniform pore sizes of molecular dimensions; these are molecular sieves with channel diameters that range from 0.3 to 1.0 nm. The interconnected channels at molecular dimensions allow the selective passage of different species of molecules with different kinetic diameters (Katsumi Kaneko 1994).

2. Materials and Methods:-

In the present work nickel doped zeolite NaA Powder had been crushed in agate mortar for prepared to the x-ray diffraction method (XRD) and Thermal Differential Analysis. Crystallinity and the phase purity

of the nickel doped zeolite NaA sample was identified from the x-ray diffraction with the help of rigaku miniflex using CuKα radiations of wavelength λ = 1.5418A˚ in the 2θ range from 20˚ to 80˚. The thermal properties of nickel doped zeolite NaA study was conceded out in the temperature range 40˚C to 800˚C to examine the phase change and the thermal information of the sample material.

3. RESULTS AND DISCUSSION

3.1 X-ray Diffraction Studies

XRD pattern of the nickel doped zeolite NaA sample is presented in fig.1 the obtained diffraction pattern was similar and matched zeolite NaA (PDF 00-039-0222). Additional Peaks 46 and 69 are representing doped nickel material (A.R. Loiola et.al. 2012).

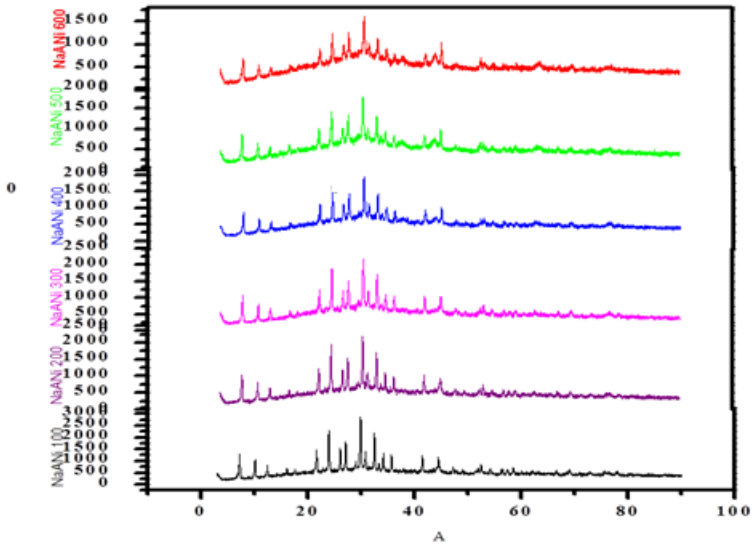

Fig 1. XRD pattern of Nickel doped zeolite NaA Sample Material for 100 ˚C to 600 ˚C.

3.2 Thermogravimetric analyses TG/DTA

fig 2. Shows the thermal analysis curve TG-DTA up to 800˚C for nickel doped zeolite NaA. The TG curve for extent temperature is about 120˚C. This suggests that the impregnated sample goes to additional thermal transformation at higher temperatures. TG curve shows that the mass loss happens in two stages. First is in the temperature range 25 to 100˚C and stage second is in 100 to 800˚C. For stage first, mass loss reached ~17.5 % and occurred at faster rate. This stage is associated with endothermic DTA event related to removel of water (Maryam Ghasemietal et.al 2016). During second stage mass loss continued to occur but at a reduced rate, which resulted in an additional ~5% loss no DTA peak was associated to this event. The total mass loss up to 800˚C for nickel doped zeolite NaA reached ~22.5%.

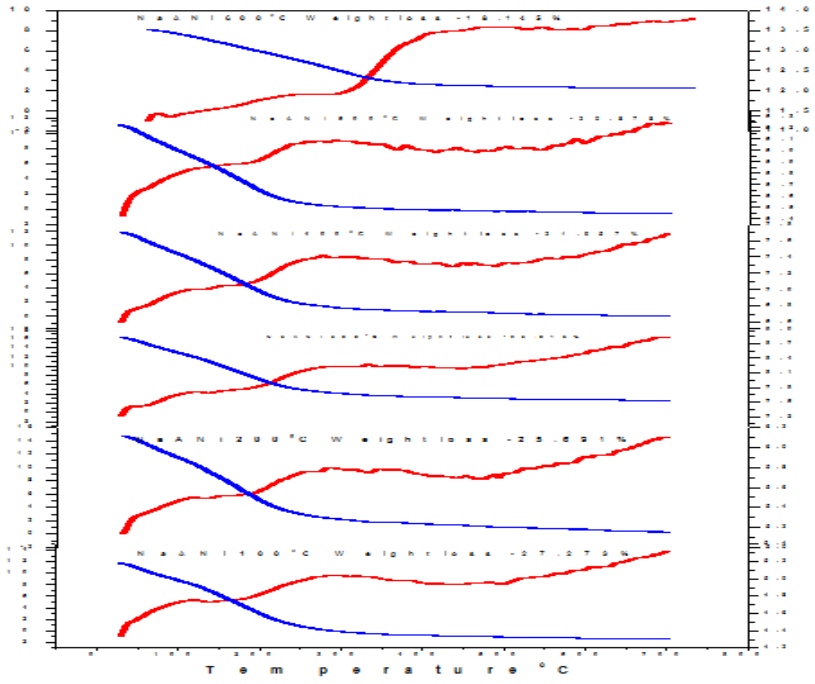

Fig 2. TG/DTA Curve for nickel doped zeolite NaA Sample Material for 100 ˚C to 600 ˚C

4. Conclusions

XRD pattern matched with JCPDS 00-039-0222. The XRD pattern shows that doped nikel at higher temperature is disappearing and structural changes observed. TG-DTA shows the nickel doped zeolite NaA material is thermally stable and shows material weight loss near about 22.5%. The temperature is increased to higher 500 ˚C to 600 ˚C then Structural changes of nikel doped zeolite NaA material and weight loss of materials is decreased.

5. References

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