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## Data Article

# Dataset on the comparison of synthesized and commercial zeolites for potential solar adsorption refrigerating system

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## ARTICLE INFO

## Article history:

Received 19 April 2018

Received in revised form

11 July 2018

Accepted 23 July 2018

Available online 26 July 2018

## ABSTRACT

The purpose of this dataset is to provide a comparison between synthesized and commercial 4A and 13X type zeolites. Metakaolin produced from the calcination of beneficiated kaolin at 750 °C for 4 h was dealuminated using sulphuric acid to get the required silica to alumina ratio for the zeolite synthesis. Zeolite 4A and 13X samples were characterized along-side with the commercial variants using X-ray fluorescence (XRF), X-ray diffraction (XRD), Brunauer, Emmett and Teller (BET) and scanning electron microscopy (SEM) techniques. These analyses revealed that, the zeolites synthesized are of comparatively acceptable quality. The pore size of 120.859 nm, pore volume of 0.0065 cm<sup>3</sup>/g and surface area of 22 m<sup>2</sup>/g were obtained from BET analyses for zeolite 4A synthesized from kaolin, while the commercial zeolite 4A used as control gave pore size of 58.143 nm, pore volume of 0.2462 cm<sup>3</sup>/g and surface area of 559.13 m<sup>2</sup>/g. In the same vein, the pore size of 10.5059 nm, pore volume of 0.135847 cm<sup>3</sup>/g and surface area of 324.584 m<sup>2</sup>/g were obtained from BET analyses for zeolite 13X

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<https://doi.org/10.1016/j.dib.2018.07.040>

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synthesized from kaolin, while the commercial zeolite 13X gave pore size of 7.2752 nm, pore volume of 0.135951 cm<sup>3</sup>/g and surface area of 310.0906 m<sup>2</sup>/g.

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## Specifications Table

Subject area	Engineering
More specific subject area	Adsorbents in a solar adsorption cooling system
Subject area	Tables and Figures
How data was acquired	XRF, XRD, SEM and BET techniques
Data format	raw values of XRF and BET, images and patterns of SEM and XRD
Experimental factors	1. Beneficiation to remove impurities from Kankara Kaolin. 2. Calcination of beneficiated kaolin at 750 °C for 4 h to produce metakaolin. 3. Dealumination of metakaolin 4. Gel formation and aging 5. Crystallization of aged product in an oven. 6. Analytical experimentation of synthesized and commercial 4A and 13X type zeolites
Experimental features	Metakaolin was produced from the calcination of beneficiated kaolin at 750 °C for 4 h and was dealuminated using sulphuric acid (96 wt/vol%) to get the required silica to alumina ratio for the zeolite synthesis.
Data source location	Department of Mechanical Engineering Ahmadu Bello University, Zaria, Nigeria.
Data accessibility	Data is available within this article

## Value of data

- It is important to promote the local content, hence a need to compare zeolites synthesized from locally sourced clay and commercial zeolites. This will ascertain if local production of the zeolites is to be encouraged.
- The comparison of the zeolites (synthesized and commercial) in terms of the crystallinity and structure, elemental composition and morphology elucidated by XRD, XRF and SEM are of great importance.
- Pore sizes, volumes and specific surface areas further highlighted the potential application of the synthesized zeolites 4A and 13X as compared to the commercial zeolites 4A and 13X for continuous adsorption cooling systems.

## 1. Data

The dataset presented in this paper for XRD as shown in Figs. 2 and 3 is the text file format plotted for the locally synthesized and commercial zeolites. The morphology of zeolites presented in Figs. 4 and 5 is at a magnification of 10.0 kx for locally synthesized and commercial zeolites (4A and 13X). The XRF (Tables 1 and 2) and BET data (Tables 3 and 4) presented are elemental composition and surface area analysis results for locally synthesized and commercial zeolites respectively.

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