Effect of Dehydration Time on Pore Distribution of Metakaolin-based Geopolymer

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1. Introduction Abstract

As catalyst supports in the nuclear waste containers in Fukushima Daiichi Nuclear Power Station, geopolymer is required to show high strength, high porosity, and durability [1]. Previous study showed that pore size distribution of potassium metakaolin based geopolymer cured at the same temperature for 4 days and was not affected by the following curing conditions. It was expected that the pore formation took place at the same viscosity. Porosity and pore size distribution were tailored by simple synthesis condition change [2]. Therefore, the timing of pore formation in geopolymer is important for understanding its influence on durability. In this research we will study the effect of dehydration time on pore distribution of potassium metakaolin based geopolymer.

2. Experimental

Geopolymer samples were made of AFACO silica, metakaolin powder, potassium hydroxide and potassium silicate solution with molar ratios of Al: Si: K: H_2O =1: 2.1: 0.8: 8. Eight samples were synthesized in mold with the lid and divided into four groups (Groups a, b, c and d), and each group consisted of two samples. In each group, one sample was with lid cured and the other one without the lid. Groups a, b, c and d were cured at 60°C for 1 to 4 days, respectively, then all the samples were taken out from the mold and placed at room temperature until the 14th day. From recording the weight changed of the sample without the lid during 14 days, the water reduced almost the same around 25% was not affected by the length of curing time.

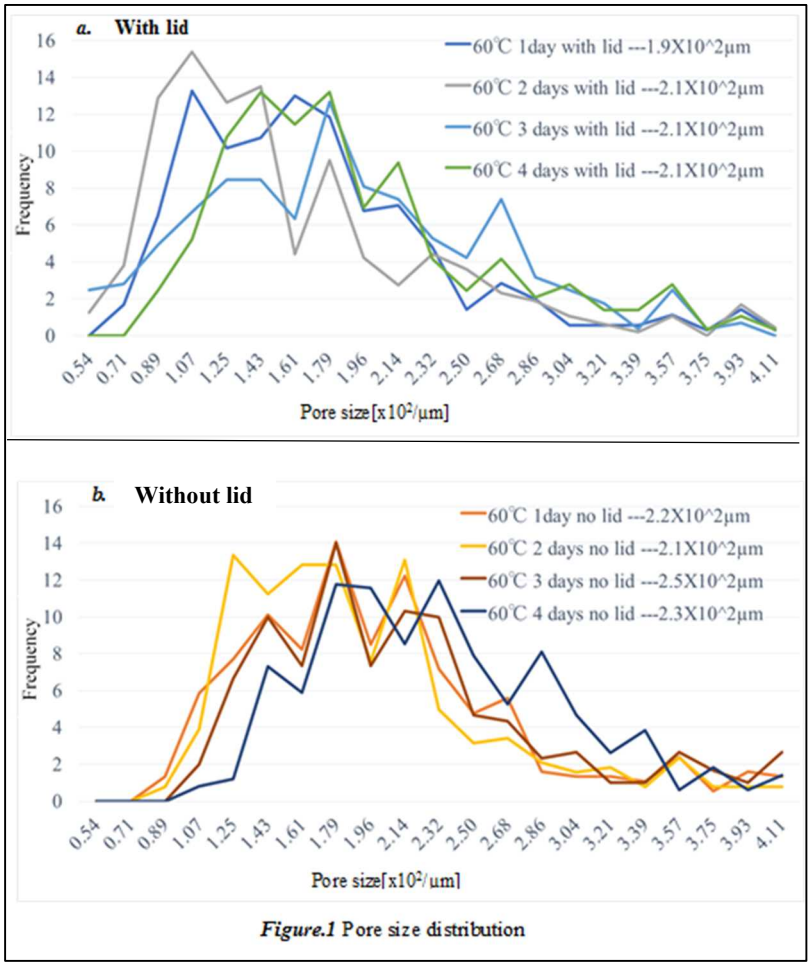

Figure.1 Pore size distribution

3. Results and discussion

The pore size distributions are shown in Fig. 1. The average pore size of the samples cured without the lid were larger than those of samples were cured with the lid. When samples were cured at 60°C for the same length of time, the average pore size of the samples with the lid were smaller than or the same as the samples without lid.

The XRD pattern showed that the sample cured with lid appeared more peaks than the sample cured without lid after 14 days

4. Conclusions

Synthesis and dehydration of potassium metakaolin based geopolymer were carried out. The pore size distribution and average pore size are affected by whether the sample was with the lid during curing. In the sample with the lid, the moisture remained in the air inside the container after it was released from the sample, it will increase the pressure inside the container, which may prevent the formation of pores.

Key words: geopolymer; metakaolin; dehydration

Reference

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