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Phillipsite Synthesis from Fly Ash by Hydrothermal Treatment with Microwave Heating and Seawater

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Summary

The coal fly ash was treated hydrothermally at 373K with mixture of NaOH and NaCl aqueous solution by the microwave heating and the conventional heating. Through this experiment, we investigated effects of additive NaCl on the crystalline phase and the generation rate of zeolites.

As a result, it was found that phillipsite can be selectively acquired from fly ash by hydrothermal treatment with the mixed solution of 0.4 N NaOH and 1.6 N NaCl aqueous solution. It was also clarified that both hydroxysodalite and phillipsite are synthesized when fly ash is treated hydrothermally with high concentration NaOH solution and NaCl solution by the microwave heating.

On the other hand, concerning the generation rate, the synthesis of phillipsite with mixture of NaOH and NaCl aqueous solution need the longer treatment time than that with NaOH solution. Because the dissolution rate of Al source from fly ash induces the generation rate of the precursor, the aluminosilicate gel. Furthermore, we revealed that the microwave heating reduces the necessary treatment time in the case of the hydrothermal treatment with mixture of NaOH and NaCl aqueous solution since the microwave heating promotes the crystallization of phillipste.