

## Conversion Process of Molten Fly Ash into Functional Materials using Waste Plastics

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A new two-step process, chlorination reduction of molten fly ash with waste plastics (PVC) to separate harmful substances, such as Na, K, Cl, Zn and Pb, from the ash, and transformation from the ash into functional materials by hydrothermal treatment with sodium hydroxide, was attempted. The ash was mixed with PVC (1 : 1), and then the mixture was heated at 1000°C in nitrogen gas. After heating, the residue was heated again at 1000°C in air to obtain the treated ash. Although raw ash contains harmful substances such as Na, K, Cl, Zn and Pb, treated ash has lower contents of these substances than raw ash. Mineral phases in treated ash are mainly gehlenite, due to the disappearance of sodium chloride and potassium chloride in raw ash by two-step treatment with PVC. While a large amount of harmful ions, ( $\text{Na}^+$ ,  $\text{K}^+$ ,  $\text{Cl}^-$ ,  $\text{Zn}^{2+}$  and  $\text{Pb}^{2+}$ ) were eluted, the elution of  $\text{Na}^+$  and  $\text{K}^+$  from treated ash was not observed, and those of  $\text{Cl}^-$ ,  $\text{Zn}^{2+}$  and  $\text{Pb}^{2+}$  decreased. Raw ash or treated ash was treated with 2 M NaOH solution at 180°C for 20 h to obtain functional materials. From both ashes, tobermorite 11 Å and hydroxyapatite can be synthesized.

**Key Words** : Waste plastics, Molten fly ash, Heating, Alkali treatment, Tobermorite 11 Å, Hydroxyapatite