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## Preparation of municipal solid waste incineration (MSWI) fly ash-based self-foaming materials and feasibility study on goaf filling

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As a toxic solid waste, the treatment and placement of MSWI fly ash has become a hot topic in society. It was found that the residual aluminum in MSWI fly ash reacted with the alkaline activator to generate hydrogen, which made the material present a pore structure without using the foaming agent. Using MSWI fly ash and coal gangue powder as the main raw materials, geopolymer foam materials with different ratios were prepared after alkali excitation. The effects of curing temperature, activator dosage and MSWI fly ash content on the compressive strength, fluidity, heavy metal leaching concentration, phase composition and pore structure of filling materials were studied. The feasibility of the application of alkali-activated MSWI fly ash-based spontaneous foam material in the filling work of mine goaf was explored. The results showed that when the curing temperature increased from 20°C to 40°C, the 28d compressive strength of the material increased by about 24.2 %. The increase of curing temperature can significantly improve the degree of polymerization and the solidification rate of heavy metals, so that more polymerization products were generated in the system and the conversion of calcium silicate hydrate (C-S-H) to calcium aluminosilicate hydrate (C-A-S-H) with higher degree of polymerization is promoted. At the same time, the curing temperature will also affect the pore structure of the material. The higher the temperature, the larger the porosity of the material, and the smaller the complexity of the spatial distribution of pores.

Keywords: MSWI fly ash; Self-foaming filling materials; Filling body; Curing temperature; Pore structure

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