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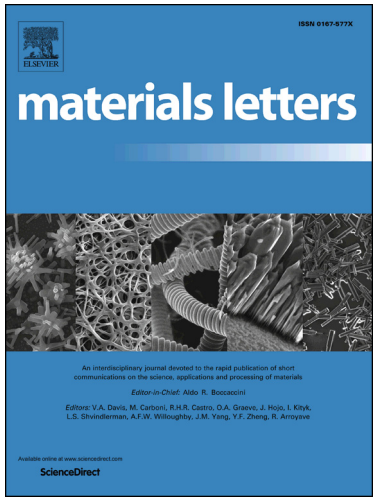

Optimal gypsum-lime content of high water material

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Optimal gypsum-lime content of high water material

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Abstract The optimal gypsum-lime content of high water material was determined by the compressive strength and hydration heat test. The compressive strength test shows the optimal gypsum-lime content in B material of high water material varies from 80-20% to 85-15%. The analysis of the hydration process of high water material with different components indicates that the peak hydration exothermic rate can reach the maximum, at optimal gypsum-lime content. The hydration products of high water material with the optimal gypsum-lime content were investigated by scanning electron microscopy (SEM). The SEM analysis manifests that the main hydration products of high water material under optimal gypsum-lime content are needle-like and prismatic ettringite, amorphous C-A-S-H gel.

Keywords High water material; Optimal gypsum-lime content; Water to binder ratio; Thermal analysis; Microstructure.

1. Introduction

High water material is an excellent mine filling material with advantages such as strong liquidity, better expansibility, and the early strength. In addition, high water material could be transported easily and actively reaches the caving top. The water volume content of high water material can reach 90% or even more of its total volume. And that is the reason why the material is named “high water material.” The high water materials consist of main materials A and B and subsidiary materials AA and BB. The main components of A material are sulphoaluminate cement. AA material consists of compound retarding dispersant. B material comprises lime and gypsum. BB material is composed of composite accelerator [1].

The strength of high water material can be affected by many factors, but it more distinctly affected by component materials. As component materials, B material has a significant effect on the strength of high water material. It was reported that mixing too much or too little gypsum and lime is disadvantageous for the strength development of high water material [2, 3]. However, these studies did not focus on the optimal gypsum-lime content of high water material. This study determined the optimal gypsum-lime content of high water material by the compressive strength test and hydration heat analysis. In addition, the hydration products of high water material

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