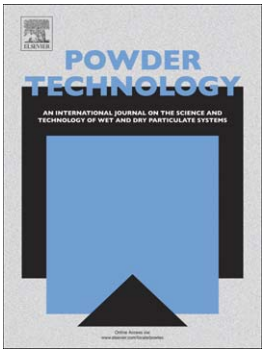

Influence of steel slag-silica fume composite mineral admixture on the properties of concrete

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Influence of steel slag-silica fume composite mineral admixture on the properties of concrete

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Abstract: A composite mineral admixture was prepared by grinding a mixture of steel slag and silica fume (steel slag/silica fume ratio is 92:8 or 84:16, by mass). A layer of silica fume was uniformly adsorbed on the steel slag particles. The influence of this steel slag-silica fume composite mineral admixture on the hydration of a cement-based composite binder and the properties of its concrete were investigated. The results show that the silica fume in the composite mineral admixture contributes significantly to the consumption of $Ca(OH)_2$ and enhances the connection between the steel slag particles with the surrounding C-S-H gel. The activity of the composite mineral admixture improves with an increase in the silica fume content. The retarding effect of the composite mineral admixture on the early hydration of cement is significant. However, a proper cement replacement by the composite mineral admixture can improve the late-age pore structure of hardened paste as well as the strength, chloride ion resistance, carbonation resistance, and sulfate attack resistance of concrete. The proper addition of the composite mineral admixture can reduce the drying shrinkage of concrete.

Keywords: steel slag; silica fume; composite mineral admixture; cement; concrete

1. Introduction

Steel slag is a by-product of the process of converting iron into steel in industry [1]. The emission of steel slag represents thirteen to twenty percent of all steel production [2]. The worldwide