Abstract

This study presents the effect of the firebrick wastes with high content of Zirconia (HCZ) as fine aggregates by a total replacement of natural sand and/or by partial replacement of cement, on the physico-mechanical and thermal properties of mortars. An experimental study was conducted out to evaluate physico-mechanical and thermal properties of firebrick-based mortars. The natural sand is totally substituted by the firebrick waste as a fine aggregate and also the cement is partially replaced by the firebrick finely ground. The results show firstly that this waste can be upgraded not only mechanically but also thermally. In fact, the microstructural analysis (heating microscopy, TG-DTA and XRD) show that the use of this waste contributes to the formation of multiple phases (corundum, zirconia, quartz, arnite, syn (Ca_2SiO_4)) whose melting point is considerably higher; this gives the nature of heat-resistant mortars. The introduction of superplasticizer increases in a remarkable way the mechanical strengths compared to normal mortar and waste-based mortars firebricks but is not recommended using superplasticizers at high temperatures. This study allows exploiting these mortars based refractory bricks HCZ up to 1400 °C