Optimization of the Corrosion Resistance of Low Cement Alumina Castable via Addition of MA Spinel

Çetin Öztürk (Afyon Kocatepe Üniversitesi), Çetin Bağlan (Süperateş Ateşe Mukavim Malzeme Sanayii A.Ş.), Ziya Aslanoğlu (Süperateş Ateşe Mukavim Malzeme Sanayii A.Ş.), Süleyman Akpınar (Afyon Kocatepe Üniversitesi), M.Serhat Başpınar (Afyon Kocatepe Üniversitesi)

Melting and holding capacity of the furnaces and the steel ladles increased dramatically in the last 20 years because of the energy efficiency requirements. Therefore, properties of the existence refractories should be improved. Well-blocks are one of the critical refractories in the steel ladles and replaced periodically during the repair periods. They are pre-cast high alumina low cement castables. Corrosion and thermal cycles are two important strains which the well-blocks are faced during the service.

The main objective of this study was to investigate the effect of $MgO.Al_2O_3$ (MA) spinel addition to the high alumina castable formulation and observe the changes in the refractory properties. For this purpose, grain size distribution of the castable was optimized on the base of tabular alumina. Fused MA spinel was added to the castable formulation (from 0 to 30 % addition) by replacing the tabular alumina grains from different grains size fractions. Samples were fired at constant temperature to observe the effect of addition solely. Effect of MA spinel addition on the basic refractory properties (Bulk density, porosity, compressive strength, linear dimension change, thermal shock determination) was investigated. Special attention was paid on static corrosion test against steel ladle slag. Improvement on corrosion resistance of the MA containing samples was observed. It was concluded that special cares must be taken when the MA spinel is used in the high alumina based castable composition (grain size selection) because of the change in the simple physical properties.

Key Words: Refractory, Castable, Alumina, MA spinel, Corrosion