ANALYZES OF INCREASING THE IMPACT VISCOSITY OF STAINLESS STEELS

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Introduction

The presence of elements that form a protective film on the steel surface - aluminum, silicon, nickel, etc. - increases the resistance of steel to corrosion. In addition to these, the homogeneity of the metal resulting from the state of the surface, intercrystalline corrosion, the properties of not being prone to decay under the influence of extremely high (creating cracks in metal and weld joints) stresses are important. There are chrome, chrome-nickel and chrome-nickel-manganese varieties. Furnace equipment, elements of heating furnaces are made from chrome 3. p. The details of equipment and products working under pressure are made in chrome-nickel and chrome-nickel-manganese trawls above. It is a great problem in the practical works, for example, turbines or any energy conversion systems by solid particle impact called erosion. It also may occur upon the action sand particle upon a surface, especially at high temperatures or upon the frictional rubbing of surfaces, wear and cavitation [1]. Li et al. [2] used copper solid particle for erosion and they observed the effects of lower impact velocities. In this context, flakes or platelets of debris were responsible for the formation of eroded surfaces. The material surface shows fractured flakes and the subsequent impacts flatten the flakes which results in erosion damage at low impact velocities. This was analyzed by lip or platelet fracture whereas it was differed with lip formation at higher impact velocities. During the experiments, the impact angles are maintained at 15°, 30°, 45°, 60°, 75° and 90°. The erosion rate is higher at 60° impact angle and then the abrasion is sharply decreased up to up to 90°. However, the erosion varies differently with the variation of impact angles for different tested materials. The erosion rates under impact velocity 40, 50 and 60 m/s are tested. The higher the impact velocity, the higher the erosion rate is noted despite the levels of erosion changes are different for different materials. The enhancement of erosion with the impact velocity is linked with the increase of kinetic energy which in turn is responsible for the increase of temperature. The combined impact of kinetic energy and temperature effects the location of the examined surfaces of stainless steels. But as the stainless steels have the better mechanical and physical properties, these show better erosion resistance in comparison of other polymer and composite materials.

These technologies are appropriate for and applicable in both developed and underdeveloped countries. Two different case studies are included in this chapter. The first involves converting soil conditioners into organic fertilizers for organic farming by composting agricultural and rural waste. The second one combines all major sources of pollution/wastes generated in rural areas in one complex called an eco-rural park or environmentally balanced rural waste complex to produce fertilizer, energy, animal fodder, and other products, according to market and need.

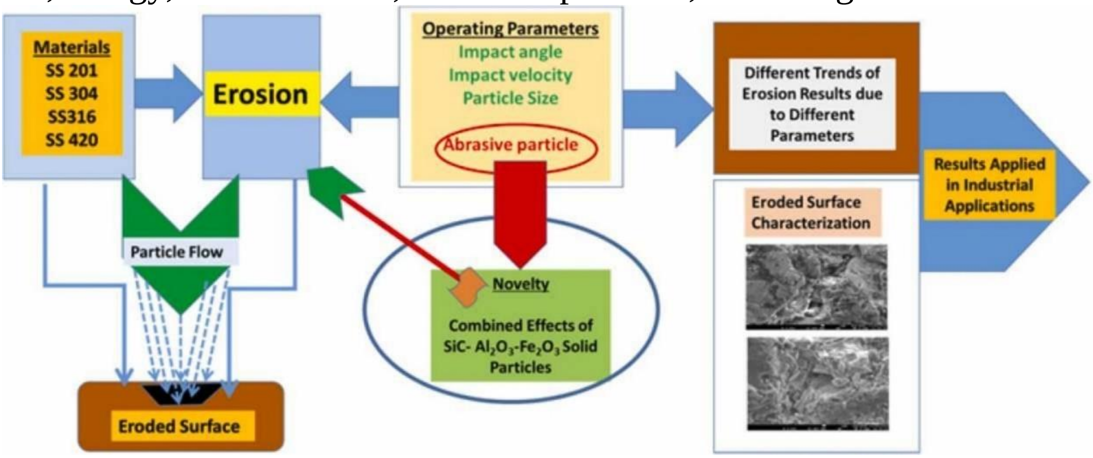

Figure 1. Processing of the steel surface.

During the eco-slag process, the slag composition is significantly changed by adding Al dross and by reducing FeO. The change in slag composition affects the erosion of the EAF refractory. During the EAF process, MgO from the refractory is soluble in the molten slag. As refractory erosion can shorten the service life of the EAF system, MgO saturation in the EAF slag is maintained by the external addition of calcined dolomite or calcined magnesite. Previous studies have investigated the solubility of MgO in CaO–SiO2–FeO–Al2O3 systems [11,12,13]; these studies have shown that MgO solubility in the molten slag system is mainly affected by the equilibrated phase of the slag, such as magnesiowüstite ((Mg, Fe)O) or spinel (MgAl2O4). In addition, the change in the thermodynamically equilibrated phase affects the ionic state and slag structure of the network-forming oxide. Using the thermodynamic calculation software FactSage 8.1 (Thermfact and GTT-Technologies, Montreal, QC, Canada), the thermodynamic equilibrium phases of the molten slags were evaluated. In the CaO–SiO2–MgO ternary system, the determined liquidus temperature was 1823.39 K and the equilibrium phase was merwinite (Ca3MgSi2O8).

It can be inferred that this system showed the highest activation energy because merwinite has a rigid structure between cations and silicate anions. The equilibrium phase changed to MgO as Al2O3 was added to the ternary system. As the equilibrium structure was simplified, the activation energy decreased. However, above 20 wt% Al2O3, the equilibrium phase changed to spinel. Due to the high affinity between the Mg cations and aluminate anions, the activation energy was increased. On the contrary, an increase in the activation energy was observed in the CaO–SiO2–FeO–MgO system as the Al2O3 concentration increased. In order to evaluate the effect of the slag structure on the viscosity, the structural change of the CaO–SiO2–FeO–Al2O3–MgO system was investigated and discussed in the following section.

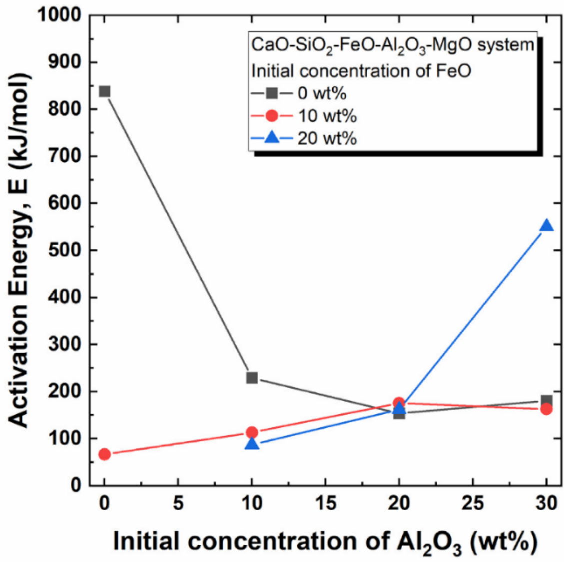

Figure 2. Activation energies of CaO–SiO2–FeO–Al2O3–MgO slag system with varying FeO and Al2O3 concentrations.

The plastic deformation patterns are influenced by the shape of abrasive particles around each indentation and a rim or lip is formed because of the proportion of material displaced from each indentation. Less localized deformation is formed due to more rounded particles, and removal of each fragment of debris needs more impacts. A considerable body of information, in the form of qualitative observations and quantitative data, has been accumulated on brown coal particles reacting in fluid beds. This includes some comparisons with pulverised fuel combustion as to ash deposition and pollutant production. The latter comparison, however, will be addressed. Mathematical models further require knowledge of the physical changes which occur as the combustion progresses. In this respect they require input information on particle shrinkage during drying and devolatilisation, on the changes in particle density throughout the various stages and on the mode of combustion of the resultant char. With the dried coals (10-13 percent H_2O) about 88 percent of the overall heat release appeared to occur within the bed at 800°C and about 80 percent at 700°C. With raw coal (60–62 percent H_2O) the proportion was estimated to be about 7 percent lower at all temperatures.

Conclusion

It is also observed the higher test duration and larger particle size have some role to increase the erosion rate. The results of this work are compared with the works of other researchers and the trends of these results are explained with the possible causes. The results of this work can be used as a reliable source for the applications of advanced technology in industry.

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