

THE FUNCTIONS OF SILICA FUME (MICROSILICA) AND OTHER ULTRAFINE OR MICROFINE ADDITIVES IN REFRACTORY CASTABLES

The unshaped refractories, commonly known as Monolithic refractories are manufactured by suitably blending graded refractory aggregates, binders, fillers & (/or) special additives used for modification of ultimate properties. The refractory aggregates chosen for the formulation of monolithics have a major contribution in determining their ultimate product quality. Along with this and many other input parameters, especially the high temperature properties of all type of Castables (Aluminous / Basic) depend a lot on the binder's level and type used. All ingredients & binders of different chemical compositions and grading are chosen, blended to provide the proper characteristics for various applications of monolithics.

For castable refractories the mobility of various particles is essential for proper placement of the castable. One method to achieve mobility is by adding more water, but this increases porosity & thus affects the performance both at normal & elevated temp. Therefore, addition of water should be minimized. The desired fluidity can be achieved by maintaining the coarser particles separated from one another by suspension of fines & microfine additives combined with the state of flocculation within the suspension. The role of the grains of these 'Microfine Additives' can be compared with those of the balls in a ball-bearing.

The commonly used ultrafine materials or microfine additives are Silica Fume also known as Microsilica or Fume Silica, microfine Alumina (Al_2O_3), superfine green Chrome Oxide (Cr_2O_3) etc. Silica fume is a byproduct of producing silicon metal or ferrosilicon alloys. Silica fume consists primarily of amorphous (non-crystalline) silicon dioxide (SiO_2). Because of its super fine particles, large surface area, and the high SiO_2 content, silica fume is a very reactive. The addition of Microsilica

has other advantages also, since these microfine silica particles easily react with alumina present in the material to form Mullite which, in turn, helps in enhancing refractory properties of the product. The addition of certain percentage of superfine green Chrome Oxide (Cr_2O_3) in Alumina castables increases the slag corrosion resistance & HMOR of the product significantly because of the formation of Alumina-Chrome (Corundum) solid-solution. Some well-known brands of fume silica are of Elkem Materials, Norchem Concrete Products.

Source: <http://viewforyou.blogspot.in/2008/12/silica-fume-or-microsilica-and-other.html>