

Chapter

A Novel Method of Hydro-Vacuum Dispersion of Metallurgical Melts: Research and Implementation

*David Sakhvadze, Gigo Jandieri, Besik Saralidze
and Giorgi Sakhvadze*

Abstract

In parallel with the gradual expansion of the consumption of powder materials and the increasing demands placed on them, the competition between the producers of powders is continually intensifying. There is no doubt that the future belongs to technologies that provide high productivity and low-cost powders. Consequently, the technology and techniques of powder production need constant revision and modernization. For this goal we have developed and proposed a new method and installation for hydro-vacuum dispersion of melts, the essence of innovation and advantage of which lies in sucking and dispersing the melt in the direction opposite to the action of the force of gravity, under gravity overload 150-200g conditions, where the main work is performed by hydraulic rarefaction resulting from a sharp refraction of direction (on 162-degree angle) and rapid expansion ($\times 10$) of a high-pressure water annular flow, with the superimposition of spatial shock- pulsating waves generated in the outer shell of the formed cone-shaped vortex. The device is characterized by high production and low energy costs, while powders - by increased specific surface, improved purity and high activity. The enhanced activity of our powders is due to the formation of non-equilibrium mechanoactivation structural-deformation stresses in them, which leads to the accumulation of excess chemical energy in them. It is justified that the application of the method is also highly effective for dispersing slag melts and obtaining amorphous hardened powdery raw materials with high hydraulic activity, suitable for the production of construction cement. Appropriate recommendations for the industrial implementation of the developed innovative technology have been proposed.