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Method for modifying hypereutectic aluminium-silicon alloys

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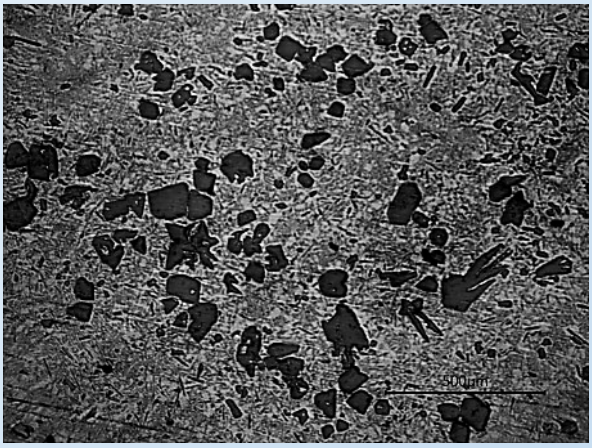
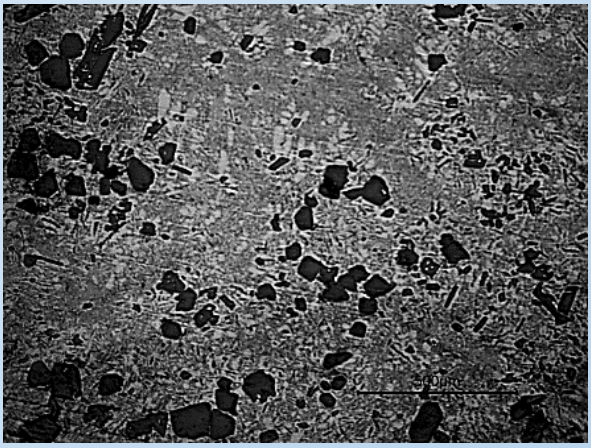
A method for modifying hypereutectic aluminum-silicon alloys by using plated nanosized particles with sizes in the range of 4-100 nm and a melting temperature of 2000 to 3000°C has been developed at TU – Sofia, for which a patent has been issued in the Republic of Bulgaria.

Application № 113281





A new approach for modifying hypereutectic aluminium-silicon alloys using plated nanomodifiers has been applied and it has been proven that their application leads to a refined structure of the alloys, resulting from both the refinement of the primary silicon crystals and the silicon crystals in the eutectic composition. The modified structure leads to increased mechanical and improved performance properties of the alloys.

Technical solution

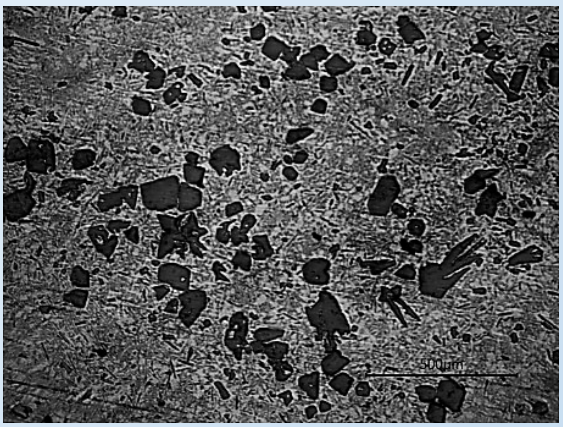
Researchers from TU – Sofia have invented a method for modifying hypereutectic aluminium-silicon alloys using plated nano-sized particles. The method for modifying hypereutectic aluminum-silicon alloys, in which activated modifying additives of nano-sized powders (4-100 nm) and with a high melting temperature (2000 to 3000°C) are used as modifiers, consists in introducing into the melt in an amount of hundredths to tenths of a percent of plated nanopowders of refractory metals (nitrides, carbides, oxides, oxycarbides, diamonds, etc.) with a particle size below 100 nm. The parameters of the technological process have been established, concerning the flux treatment of the metal melt (refining), degassing, modification and pouring of the casting molds with liquid metal. The preservation of the modifying effect after the second and third remelting of the alloys has been established.

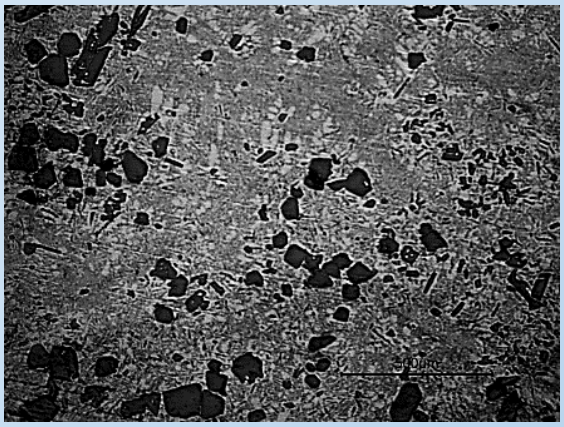
Application and advantages

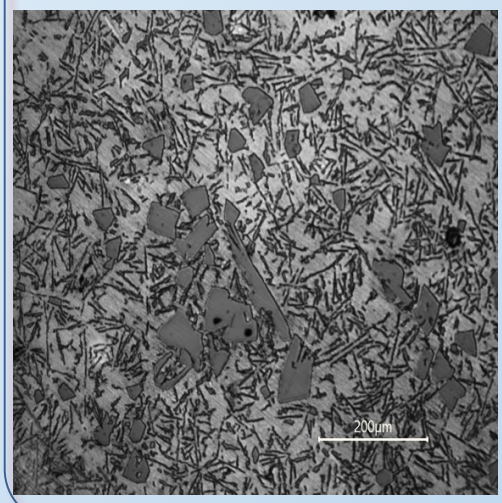
The invention relates to the processing of melts of hypereutectic aluminium-silicon alloys with modifiers and finds application in the metallurgical production of hypereutectic aluminium-silicon alloys in the form of blocks intended for remelting. The method is used for melting hypereutectic aluminium-silicon alloys for the production of automobile pistons and parts subjected to friction and wear (with or without lubrication of the boundary layer), and remelting of technological waste or scrap from this production.

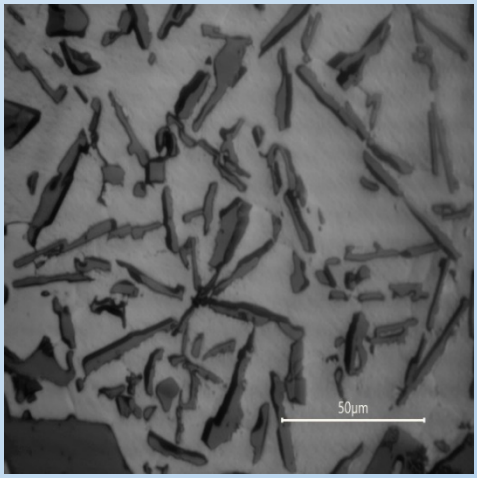
The advantages of the invention consist in the fact that the use of nanomodifiers for modifying hypereutectic aluminium-silicon alloys has the effect of modifying all phases and structural components in the structure of the resulting castings and preserving the modifying effect during prolonged residence of the modified melt and during its subsequent remelting.

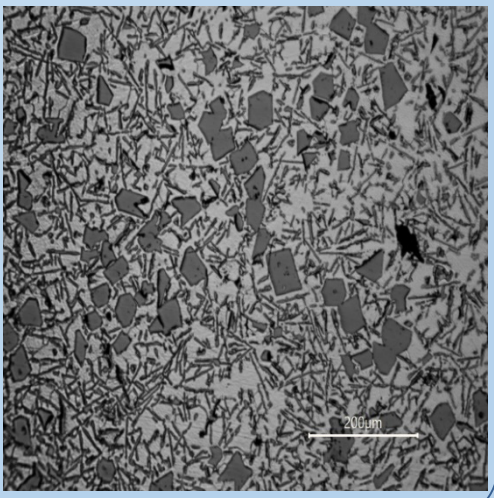
Technological images











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