

The invention relates to ferrous metallurgy. A method for thermal strengthening of steel grinding balls comprises the subcooling of balls after rolling on still air, quenching them to the reception of initial temperature of self-tempering, which exceeds at 50-80 °C the point of martensite transformations, and self-tempering which is carried out during not less than 50 hours with the rate of cooling of not more than 3 °C/h. A method allows the obtaining of steel balls with high mechanical properties and reducing a formation of cracks at quenching.