World Academy of Science, Engineering and Technology
International Journal of Materials and Metallurgical Engineering
Vol:15, No:03, 2021

# Production of Ferroboron by SHS-Metallurgy from Iron-Containing Rolled Production Wastes for Alloying of Cast Iron

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**Abstract :** Traditional technologies for processing iron-containing industrial waste, including steel-rolling production, are associated with significant energy costs, the long duration of processes, and the need to use complex and expensive equipment. Waste generated during the industrial process negatively affects the environment, but at the same time, it is a valuable raw material and can be used to produce new marketable products. The study of the effectiveness of self-propagating high-temperature synthesis (SHS) methods, which are characterized by the simplicity of the necessary equipment, the purity of the final product, and the high processing speed, is under the wide scientific and practical interest to solve the set problem. The work presents technological aspects of the production of Ferro boron by the method of SHS - metallurgy from iron-containing wastes of rolled production for alloying of cast iron and results of the effect of alloying element on the degree of boron assimilation with liquid cast iron. Features of Fe-B system combustion have been investigated, and the main parameters to control the phase composition of synthesis products have been experimentally established. Effect of overloads on patterns of cast ligatures formation and mechanisms structure formation of SHS products was studied. It has been shown that an increase in the content of hematite $Fe_2O_3$ in iron-containing waste leads to an increase in the content of phase FeB and, accordingly, the amount of boron in the ligature. Boron content in ligature is within 3-14%, and the phase composition of obtained ligatures consists of $Fe_2B$ and FeB phases. Depending on the initial composition of the wastes, the yield of the end product reaches 91 - 94%, and the extraction of boron is 70 - 88%. Combustion processes of high exothermic mixtures allow to obtain a wide range of boron-containing ligatures from industrial wastes. In view of the relatively low melting point of the obtained SHS-ligature, the positive dynamics of boron absorption by liquid iron is established. According to the obtained data, the degree of absorption of the ligature by alloying gray cast iron at 1450°C is 80-85%. When combined with the treatment of liquid cast iron with magnesium, followed by alloying with the developed ligature, boron losses are reduced by 5-7%. At that, uniform distribution of boron micro-additives in the volume of treated liquid metal is provided. Acknowledgment: This work was supported by Shota Rustaveli Georgian National Science Foundation of Georgia (SRGNSFG) under the GENIE project (grant number № CARYS-19-802).

**Keywords :** self-propagating high-temperature synthesis, cast iron, industrial waste, ductile iron, structure formation
**Conference Title :** ICRAF 2021 : International Conference on Recent Advances in Ferroalloys
**Conference Location :** Prague, Czechia
**Conference Dates :** March 22-23, 2021