



*Proceedings of Iran International Aluminium Conference (IIAC2018)
April 24-25, 2018, Tehran, I.R. Iran*

***In situ* synthesis of Fe-TiC/Al₂O₃ hybrid nanocomposite via mechanical activation-assisted combustion reaction of ilmenite-Al-C system**

Morteza Fallahi¹, Mohammad Khoshghadam Pireyousefanz, Sadjad Sabzalian¹, Mansour Soltanieh^{1*}, Mandana Adeli¹

1: School of Metallurgy and Materials Engineering, Iran University of Science and Technology (IUST), Narmak, Tehran 16844, Iran
2: Nanotechnology Department, School of New Technologies, Iran University of Science & Technology (IUST), Narmak, Tehran, 16846-13114, Iran

Abstract: In this research, fabrication of Fe-TiC/Al₂O₃ nanocomposite from ilmenite-Al-C system was studied using mechanically activated powders. The effects of Al/C molar ratio and heat treatment temperature on synthesized products were investigated. The synthesized nanocomposites were characterized by X-Ray Diffraction (XRD), Scanning Electron Microscopy (SEM), Field Emission Scanning Electron Microscopy (FE-SEM) and Raman spectroscopy. The results showed that for the system with Al/C: 1/2.5 molar ratio and after ball-milling for 6h, the major formed phases were Fe and TiO₂ during heat treatment at 990°C for 3h and the mechanical activation was inefficient. However, for the system with Al/C: 2/1 molar ratio not only iron was reduced to some extent during ball milling process, but also the combustion reaction was completed and the Fe-TiC/Al₂O₃ nanocomposite was fabricated after heat treatment at 990°C for 3h. The TiC and Al₂O₃ crystallite sizes were calculated to be 23 and 38 nm, respectively.

Keywords: nanocomposite, mechanical activation, combustion synthesis, ilmenite, aluminium.