National Institute of Technology Rourkela

Defence Seminar

Seminar Title	: Nano–Reinforced Al2O3–MgO–C Refractories
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Venue	: Seminar Hall, Depatment of Ceramic Engineering
Date and Time	: 27 Mar 2024 (4:00 PM)
Abstract	: A range of steel making vessels and continuous casting components recommend the usage of refractories in Al_2O_3&ndashMgO&ndashC system, which is attributed to their beneficial structural properties (oxidation resistance, hot strength, thermal shock performance, load-bearing capacity, mechanical reliability). In the current work, nano-reinforced Al_2O_3&ndashMgO&ndashC refractories were fabricated by using two different types of nanoscale reinforcements, namely YAG ($Y_3Al_5O_{12}$ Yttrium Aluminium Garnet) nanopowder and EG\YAG hybridized powder (EG- Expandable Graphite). Similarly, the standard Al_2O_3&ndashMgO&ndashC refractories were also fabricated without addition of reinforcing agents in order to study the advantageous features of nanoscale reinforcements in promoting the structural property benefits. Further, both of these standard and nano-reinforced refractories were separately fired in oxidizing atmosphere as well as non-oxidizing atmosphere at a maximum temperature of 1600ºC and then evaluated their structural properties. The experimental findings indicated that the nano-reinforced Al_2O_3&ndashMgO&ndashC refractories showed significantly enhanced structural properties in contrast to the standard components. On the plus side, the EG\YAG reinforced refractories displayed comparably improved structural properties over the nano-YAG reinforced refractories. Such structural property benefits with EG\YAG reinforcement were ascribed to the in&ndashsitu grown, bimodal, core (YAG)&ndashsheath (EG) microstructure in all parts of the high&ndashtemperature treated, nano&ndashreinforced Al_2O_3&ndashMgO&ndashC refractory. This feature confirms that the nanoscale EG\YAG powder as an efficient reinforcement than the YAG nanopowder. Additionally, this work also proposes novel materials design strategies for the fabrication of fracture&ndashresistant, nano&ndashreinforced refractories in Al_2O_3&ndashMgO&ndashC system as well as guidelines for implications of these research findings to practical applications in various potential areas of steel making.