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Catalytic graphitization of novolac resin for refractory applications

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Abstract

This study investigated how to induce graphite generation from the carbonization process of novolac resins using conditions that can be adopted for carbon-containing refractories (CCRs) production. The effect of boron oxide or boric acid (graphitizing agents), cross-linking additive (hexamethylenetetramine) and some processing parameters (mixing technique, vacuum degassing, heating rate and thermal treatments) on carbon graphitization from a commercial novolac resin were evaluated. The X-ray diffraction (XRD) technique was selected to measure the graphitization level and crystal parameters of the prepared samples. Based on the attained results, adding graphitizing agents prior to the pyrolysis of resin resulted in carbon crystallization. The best graphitization level was obtained when the mixtures containing 6 wt.% B₂O₃ or 10 wt.% H₃BO₃ were fired up to 1000°C for 5 hours using a heating rate of 3°C/min. Although the reproducibility of the obtained results was ascertained, heterogeneous graphitization could be observed based on the XRD profiles, as well as some discrepancies in the calculated graphitization level values. This phenomenon was

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