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Oxidation behavior at moderate temperature under dry and wet air of phenolic resin-derived carbon

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Highlights

- Evaluation of the oxidation behavior of phenolic resin-based carbon at 623-773 K
- Evaluation of the oxidation behavior in both dry and wet air
- Determination of oxidation kinetic laws (activation energy, partial orders)
- Proposition of an oxidation mechanism in relation with the structural properties

Abstract:

The oxidation behavior of carbon materials has been investigated at temperatures less than 773 K using isothermal thermogravimetric analyses under dry and wet air. Bulk samples obtained by the pyrolysis of phenolic resin have been characterized using X-ray diffraction and elementary analysis. X-ray photoelectron spectroscopy and Raman spectroscopy have been performed to analyze the surface and subsurface. The carbon structure has a poor organization state and a gradient in the oxygen concentration and structure between the surface and the bulk is revealed. The material is more reactive under wet air than dry air in terms of oxidation rates as determined between 623 and 773 K. The apparent activation energies are respectively 122 ± 6 kJ/mol in dry air and 102 ± 6 kJ/mol in wet air.

Key words: Phenolic Resin; Carbon materials; Thermogravimetric Analyses; Oxidation behavior; Reaction Kinetics; Structure

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