

## Abstract

# RHEOLOGICAL PROPERTIES OF PITCH-THERMOPLASTIC AS A PRECURSOR IN THE PRODUCTION OF CARBON MATERIALS

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Coal tar pitch is a heavy thermoplastic residue formed during the distillation of coal tar. It is a heterogeneous system of highly condensed carbo- and heterocyclic compounds and is capable of exhibiting polymeric properties.

Coal tar pitch due to its unique properties is a promising and inexpensive raw material for the production of various carbon materials: carbon composites, solid foams, carbon fibers, adsorbents, etc. The main problem is that its rheological properties do not meet the requirements for the production of carbon materials. Coal tar pitch refers to non-Newtonian fluids, the degree of anomaly of which increases with decreasing temperature and with a small shear stress.

It has been established that when the temperature of the coal tar pitch changes in the range from softening point to 125 °C, a transition from elastic-brittle bodies to solid-like plastic and further to structured and Newtonian liquids is observed. At a temperature of more than 125 °C, coal tar pitch exhibits a Newtonian flow, due to the destruction of its coagulation structure, that is, it has a very low viscosity. This does not allow its use in the processes of obtaining carbon materials, which are carried out at higher temperatures.

The paper shows that pretreatment of coal tar pitch with polyvinylchloride (PVC) and polymethylmethacrylate (PMMA) allows to change and to control the viscosity of the pitch precursor.

By varying the time of modification and the amount of PVC and PMMA, it is possible to change the flow index of the resulting pitch-thermoplastic from 0.5 to 100 g/10 min (at 150 °C).

Modification of the coal tar pitch with polar polymers at the processing temperature of the pitch to 170 °C provides the obtaining of plastic material – pitch-thermoplastic with the specified rheological properties, which allows it to be used as a precursor in the production of carbon foam, carbon composites, and others.

The advantages of modifying coal tar pitch with polar polymers are the use of fairly low temperatures and the absence of any waste that allows solving ecological and energy-saving issues of obtaining a pitch precursor.