

Processes during oxidative stabilisation of PAN-based carbon fibres

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About 70 percent of Carbon fibres are produced by a thermal treatment of polyacrylonitrile (PAN) fibres. Key processes during the synthesis of carbon fibres are the oxidative stabilisation of PAN-fibres and the carbonisation of the stabilised fibres in inert atmospheres.

Measurements of constitutional changes and characterisation of processes during the oxidative stabilisation are very suitable for optimising and controlling the synthesis and the properties of the carbon fibres. Thermomechanical analysis (length changes), Thermogravimetry (mass changes), Differential Scanning Calorimetry (thermal effects), and Mass Spectrometry (gas analysis) have proved to be excellent in situ tools for investigating and understanding these processes.

During oxidative stabilisation the following processes are observed: (1) cyclisation; (2) dehydrogenation and (3) oxidation. Beside these main reactions further processes take place. Reactions which result in length changes, mass changes, caloric effects or gas formation are investigated by thermoanalytical methods.

Results of the thermoanalytical investigations and examples for the kinetic analysis of the results are presented. With the analysis of the kinetics using experimental results, it is possible to obtain information about the specific mechanisms of the reactions.

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