

Self assembly during the pyrolysis of coking coals and its exploitation for the synthesis of new carbon materials and nanomaterials

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The formation of ordered carbon during the thermal treatment of some bituminous coals occurs by a unique natural process of discotic fluid self assembly and covalent capture. The report by Brooks and Taylor in 1965 of this ordered fluid intermediate, carbonaceous mesophase, represents the original discovery of the discotic nematic liquid crystalline phase. This talk will describe the origin, properties and behavior of carbonaceous mesophase and its relation to other discotic materials. The discotic assembly process occurring naturally in coal can also be systematically directed by templates and nanoconfined spaces to make unique supramolecular disk assemblies that can be converted to carbons by thermal treatment. The talk will discuss the synthesis of new carbon nanofibers and nanotubes as well as ordered and patterned thin films, whose graphene layer arrangements and properties can be molecularly engineered by this principle.

A full manuscript will be published in Fuel.