

Radicals produced by 2,3-Dimethyl-2,3-diphenylbutane for homogeneously rapid stabilization of coal tar pitch

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Abstract

Stabilization is one of the important processes for maintaining morphology and affecting physical and chemical properties during the preparation of pitch-based carbon products. Due to the pitch is composed of a large amount of polycyclic aromatic hydrocarbons, less side chains, and low reactivity with oxygen, so the pitch is difficult to be stabilized. In this study, DMDBP was used to modify the pitch molecules. Because the chemical bonds between the two quaternary carbon atoms in DMDBP are unstable, which are easily broken during the heating process to generate free radicals, thereby increasing the free radical concentration of the modified pitch. The results reveal that after stabilization under nitrogen atmosphere, the free radical concentration of DMDBP modified pitch is almost 1.5 times than that of the raw pitch, and the corresponding molecular weight distribution also shifts to large ones. After stabilization in air atmosphere, the oxygen content of the DMDBP modified pitch is significantly increased, and the incremental carbon yield after high-temperature carbonization is about 3.5 times that of the unmodified pitch, and the micromorphology of pitch artifact can be well maintained. Therefore, to achieve rapid and homogeneous stabilization by increasing the concentration of the radical of the pitch matrix in the view of the free-radical mechanism is a simple and environmentally friendly approach that offers possibilities of greatly reducing the cost of pitch-based products.