

### 论文摘要

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### 沥青调制温度对活性炭材料结构及 电容特性的影响

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**摘 要:**以煤焦油沥青为原料, 在不同温度下调制得到碳质微晶结构的中间相沥青, 采用化学活化法制得超级电容器用高比表面积活性炭。以制备的活性炭作电极材料组装模拟电容器, 6 mol/L KOH溶液为电解液, 考察了中间相沥青的调制温度对活性炭结构和电容行为的影响。结果表明: 随着调制温度的提高, 活性炭比表面积先增加后减小, 在450 °C时达到最大值, 为3 250 m<sup>2</sup>/g; 制备的活性炭孔径主要集中在1~4 nm范围内; 在350 °C时, 无定形结构的中间相沥青有利于扩孔, 制得的活性炭具有较高的中孔含量; 随着调制温度的继续提高, 中孔含量下降; 活性炭比电容量随着调制温度的提高先增大后减小, 450 °C时达到最大值, 为215 F/g。

**关键字:** 超级电容器; 中间相沥青; 活性炭; 化学活化

### Effects of temperature modification of mesophase pitches on structure and electrochemical performance of activated carbons

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**Abstract:** Using coal-tar pitch as raw material, the mesophase pitches with carbonaceous crystallites were produced at different temperatures, and the ultra-high surface area activated carbons for supercapacitors were prepared by chemical activation. Coin type cells using the prepared activated carbons as electrode materials were assembled, and 6 mol/L KOH solution was selected as the electrolyte. The effects of modification process of the mesophase pitches on the structures and the electrochemical behaviors of activated carbons were investigated. The results indicate that the specific surface area of activated carbons increases while then decreases with increasing temperature, and the surface area of activated carbon modified at 450 °C is 3 250 m<sup>2</sup>/g. The micropore sizes are ranged from 1 nm to 4 nm, and the unformed structure modified at 350 °C is beneficial to pore-widening, so the activated carbons exhibits higher mesopore volume. When the

temperature increases, the mesopore volume decreases. The capacitance of the activated carbon increases while then decreases with increasing temperature, and the maximum specific capacitance is 215 F/g, which is acquired from the carbon modified at 450 °C.

**Key words:** supercapacitor; mesophase pitch; activated carbon; chemical activation

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