

**Insight into the development of 2~4 nm mesopores in KOH-activated hierarchical porous carbons: the role of small polycyclic aromatic hydrocarbons molecules**

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**Abstract:** Tailoring porosity of hierarchical porous carbon materials (HPCs) have always been attracting particular interesting and usually achieved by introducing additives or templates. Herein, the effect of small polycyclic aromatic hydrocarbons (PAHs) and their compounds on the pore development of KOH-activated HPCs has been investigated using naphthalene-derived pitch as a model precursor. The small PAHs are obtained from the pitch precursor by toluene extraction. The results indicate that the small PAHs can significantly influence mesopore (especially the pores with diameter of 2~4 nm) development of the pitch-based HPCs. The removal of small PAHs not only functions as channels for melted KOH penetration at the beginning but also works as template that helps in forming 2~4 nm macropores during activation. The optimized specific surface area and pore volume can be obtained as the content of small PAHs in precursor is 40%~60%. The conclusion could be also built in comparing the pore structures of other HPCs derived from a variety of commercial/modified pitches and the composite of pitch and phenolic resin. This work shed light on the bottom-up design of HPCs with tunable porosity in larger scale by a cost-effective and easy template-free way, which only needs to modulate the content of small PAHs in precursors.