Mass Transfer Driven Pore Engineering of Activated Carbon from Activation of Biomass

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Supplementary Information

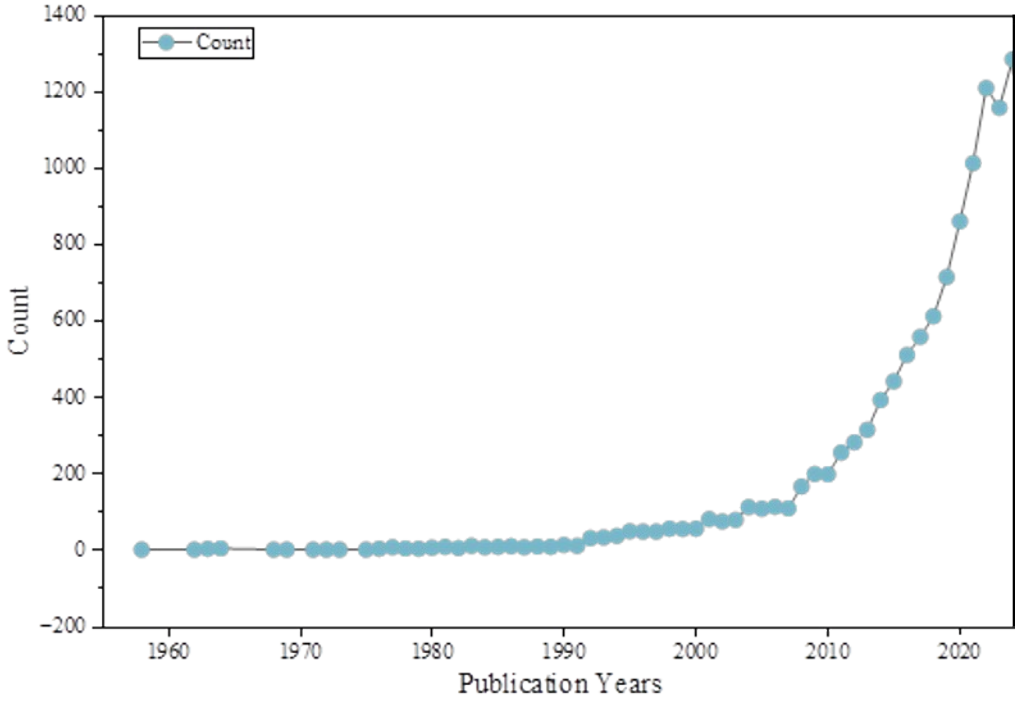

Figure S1. Research trends of biomass active AC.

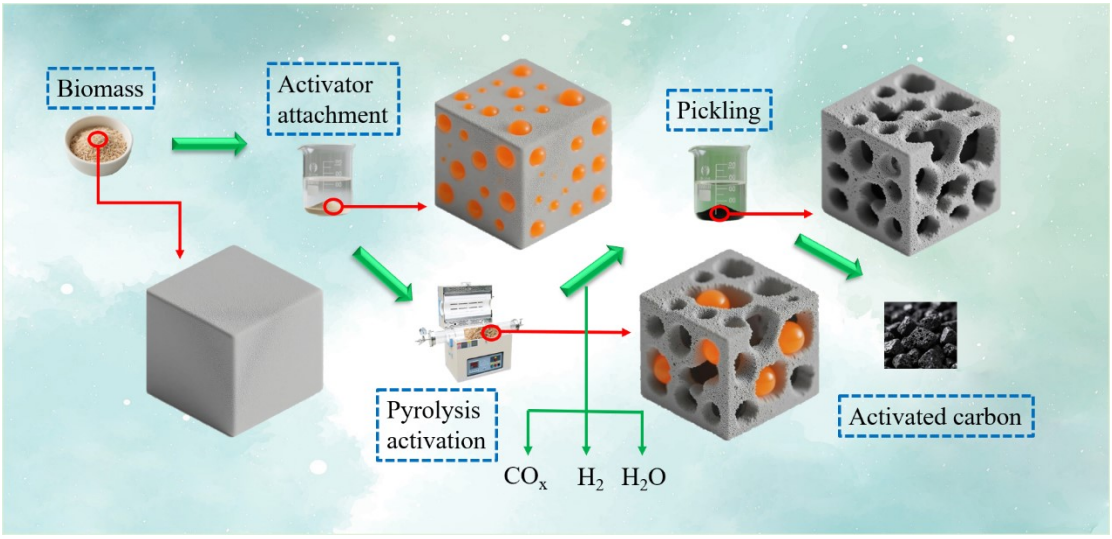

Figure S2. General process and principle of chemical activation.

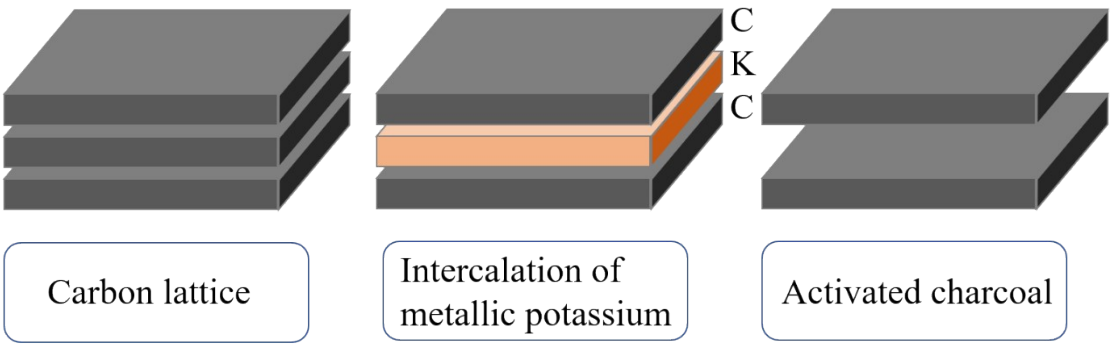

Figure S3. Interlayer effect of metal K.

Table S1. Explanation of pore related terms

Term	Object and Definition
Pore	Refers to the space or cavity within which substances are stored, emphasizing its static and spatial properties.
Pore throat	A narrow channel connecting two cavities. This is the most critical limiting part in the pore network.
Channel	Connected channels. Emphasize its function as a material transport 'path'.
Mass transfer pathway	Include pathways for transmission through various means such as pores, grain boundaries, and surface diffusion.
Network	The overall topology structure composed of interconnected cavities and throats.

Table S2. Directional control of activated carbon for gas adsorption

Target gas	Core requirements	Key regulatory strategies
CO_2	Micropore matching+basic sites	KOH activation+nitrogen doping; temperature 500-600℃; microwave heating to reduce diffusion resistance
VOCs	Mesoporous channels+hydrophobic/π interaction sites	Phosphoric acid activation (mesoporous); raw material pre-ashing; low-temperature carbon retention with alkyl chain or pyridine nitrogen modification

Table S3. Working principle of supercapacitor

Mechanism	Principle	Characteristic	Contribution
Double-layer capacitance	Electrolyte ions electrostatically adsorb onto activated carbon pores, forming an electric double layer	Physical process, fast response and long cycle life	Primary
Pseudocapacitance	Surface functional groups on activated carbon enable rapid, reversible pseudocapacitive reactions	Chemical process, provides higher specific capacity but compromise stability	Secondary