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Sulfur Tuned Advanced Carbons: Towards subtle modifications of sulfur lining

Recently a novel method of controlled sulfur insertion to carbon pores has been introduced leading to sulfur-tuned advanced carbons (STACs) [1]. In this environmentally benign approach melted sulfur enters the pores owing to their hydrophobic character and external pressure provided by steam (SASI steam-assisted sulfur insertion). Whan carbon blacks with very limited surface groups were used as sulfur hosts. elemental sulfur directly lined the carbon pore surfaces, gradually filling the pores (from small to large) and its significant amount was the monoclinic γ phase [1].

To investigate the effects of carbon surface groups on sulfur penetration and its forms, the carbon host was oxidized, and then it was impregnated with urea and heated at elevated temperatures to introduce nitrogen-containing groups to the carbon matrix. This treatment also slightly affected the porosity of the sulfur host. The amount of sulfur inserted to the pores was adjusted taking into consideration the specific pore size distributions of the host. Even though at high sulfur contents the materials show similar properties governed mainly by elemental sulfur deposited in the pores, at low loadings, differences in interface chemical environment were found. It was linked to the reactions of small sulfur fragments with surface groups. The introduced chemical heterogeneity was found as affecting catalytic decomposition of toxic CEES (adsorbed in the pore system)

1) Barczak, M., Florent, M., Bhalekar, S., Kaneko, K., Messinger, R.J., Bandosz, *Adv. Funct. Mater*. **34**, 2310398 (2024).