Mechanochemical synthesis – A green approach towards nanoporous materials

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Although mechanical forces have been used since ancient times to conduct chemical reactions (e.g. pesteling), it is probably poorly understood. The modern revolution of mechanochemistry in materials science is based on the potential usefulness of the strong mechanical energy obtained from grinding/milling of solid chemical systems in the absence of solvents and thermal energy. Therefore, the mechanochemical synthesis is an attractive alternative route to be explored towards nanoporous materials. Although this method is rather destructive, we were able to prepare a well-defined structure with intrinsic porosity [1]. For instance, a mechanochemical Friedel-Craft alkylation was utilized to synthesize covalent triazine frameworks, with quantitive yield and a surface area of 570 m^2/g; inside the ball mill. Additionally, we have synthesized nitrogen- doped porous carbons from lignin (a sustainable carbon precursor), urea (N source) and K_2CO_3 (activating agent). The grinding provides not only homogeneous distribution of the activating agent, but also, and more interesting, promotes the incorporation of N-containing functional groups into the lignin backbone. As a result, nitrogen-doped porous carbons with high surface area (S_{BET}= 3000 m^2/g) and more than 6 wt % of nitrogen can be prepared [2].

Reference(s)

[1] E. Troschke, S. Grätz, T. Lübken, L. Borchardt, *Angew.Chem.* **2017,** 56, 6859-6863.

[2] C. Schneidermann, N. Jäckel, S. Oswald, L. Giebeler, V. Presser, L. Borchardt, , *J. Chem.Sus.Chem.* **2017**, DOI: 10.1002/cssc.201700459.