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Spectroscopical characterisation of high surface area carbons through a multitechnique approach

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High surface area carbons are industrially relevant materials whose properties depend on morphology, texture and surface features. The detailed characterization of functional group on the surface of this class of materials is a fundamental step for understanding their potential in a variety of applications. Unfortunately IR, the widely used laboratory spectroscopy method, is difficult to be applied on carbons due to the intrinsic strong absorption.
We present here an multitechnique approach, based on the synergic combination of three vibrational spectroscopies: i) FT-IR diffuse reflectance spectroscopy (DRIFT), that, limiting the strong absorption of the transmitted light is effective in evidencing vibrations with change in the dipole; ii) back-scattering Raman spectroscopy, which is sensitive mostly to carbon bulk vibrational modes; iii) Inelastic Neutron Scattering (INS) that, eliminates the problem of radiation interaction and is sensitive to vibrations involving hydrogen including species, highly aboundant on carbons surface. The three technique are applied to two classes of activated carbons, subjected to specific chemical treatments. The whole set of experimental data, interpreted with the help of DFT calculations, allow us to point out their structural and surface properties, and to clarify some controversial information present in the specialized literature, where conclusions are done on the basis of the data obtained by a single technique.

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