ESRF	**Experiment title:** Effect of size and polarity of guest molecules in adsorption on activated carbons	**Experiment number**: 02-01-636
Beamline: BM02	**Date of experiment**: from: 12/04/2004 to: 17/04/2004	**Date of report**: 27/08/2004
Shifts: 15	**Local contact(s)**:E. Geissler	*Received at ESRF:*

Names and affiliations of applicants (* indicates experimentalists):

K. László* Department of Physical Chemistry, Budapest university of Technology and Economics

C. Rochas* Laboratoire de Spectrométrie Physique, Université J. Fourier de Grenoble

E. Geissler* Laboratoire de Spectrométrie Physique, Université J. Fourier de Grenoble

Report: In this experiment, two incident energies were used, 8 keV and 18 keV, covering the range 2 $10^{-3} \leq q \leq 1.8$ Å^{-1}. The activated ground carbon samples were held in sealed capillaries, which had previously been baked at 120°C for 24 hours to remove trapped water vapour and then the solvents were added before sealing. The solvents used were cyclohexane, iso-octane, alpha pinene, iso-propanol and water vapour. In addition, carbon monoliths obtained by carbonisation of wood cubes from *picea abies* were investigated. Owing to the channel structure of the original wood, the latter speciments were strongly anisotropic at low q. Figures 1 a and b show examples of the isointensity contour scattering pattern from a specimen carbonized at 700°C. These samples display microporosity at high q values (at the outer edge of the figures), where the signal is isotropic. At low q, as shown in figure 1, the

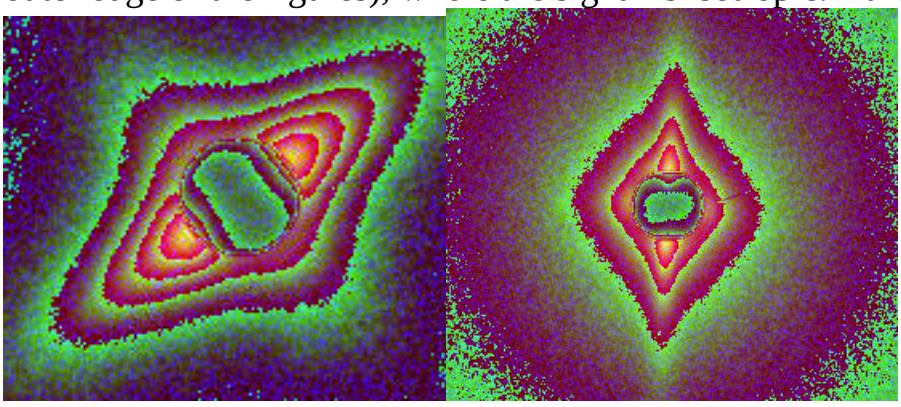

Figure 1 a b

Isointensity SAXS scattering patterns from carbonised *picea abies* in parallel (a) and perpendicular (b) direction to wood channels.

scattering is from smooth surfaces (slope -4). As the temperature of preparation is raised from 700°C to 1000°C the surfaces become increasingly rough and mass scattering develops with a fractal slope corresponding to branched structures (D=2.5). In the parallel direction, in certain cases that depended on the precise orientation of the pore walls, multiple scattering was encountered.
In the activated carbons prepared from polyethylene-terephthalate (PET), multiple scattering was not observed.

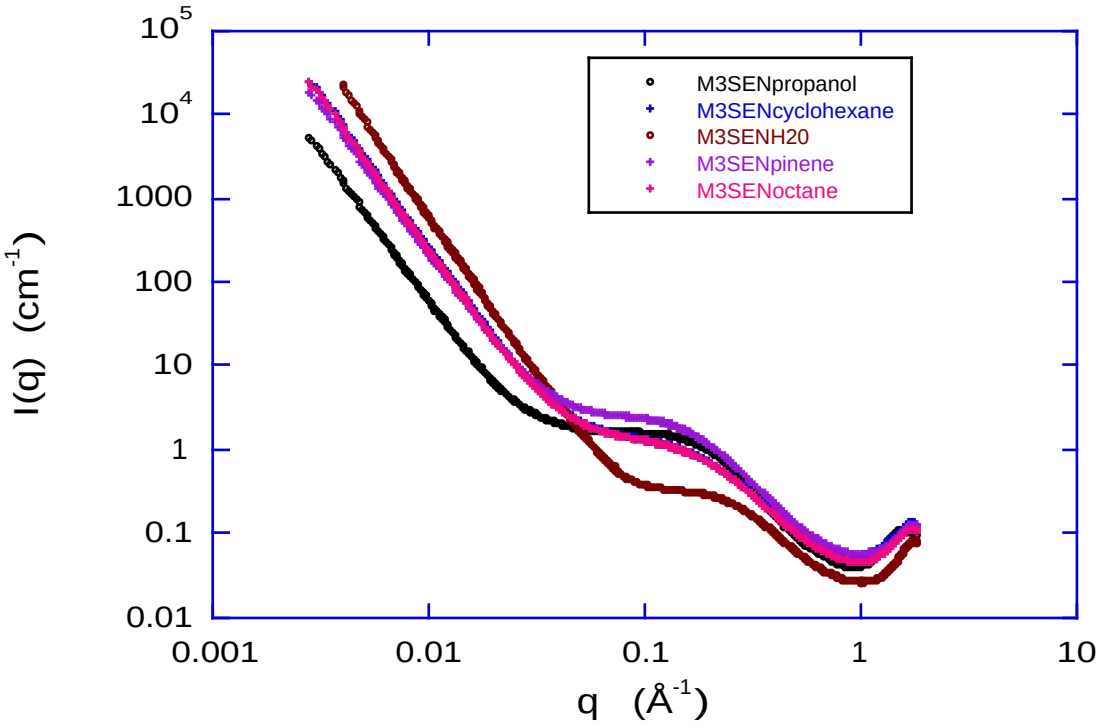

Figure 2 Scattering curves from an activated carbon treated with hot nitric acid in the presence of different solvents.

In all, seven different activated PET carbon samples were investigated in the various solvents. The calculated surface areas of contact between the carbon and the solvents lie between 1500 and 2000 m^2/g for the room temperature treated carbons and between 500 and 800 m^2/g for the hot acid treated ones. Significant differences occur depending on the polarity and size of the molecules. Some of these results were presented at Carbon 2004 (Providence, RI) by K.László, K. Marthi, F. Ehrburger-Dolle, E. Geissler, while others will be presented as a lecture at PORANAL, Balatonfüred, Hungary in September 2004. A complete article describing these results and authored by K. László, C. Rochas and E. Geissler is in preparation.