ESRF

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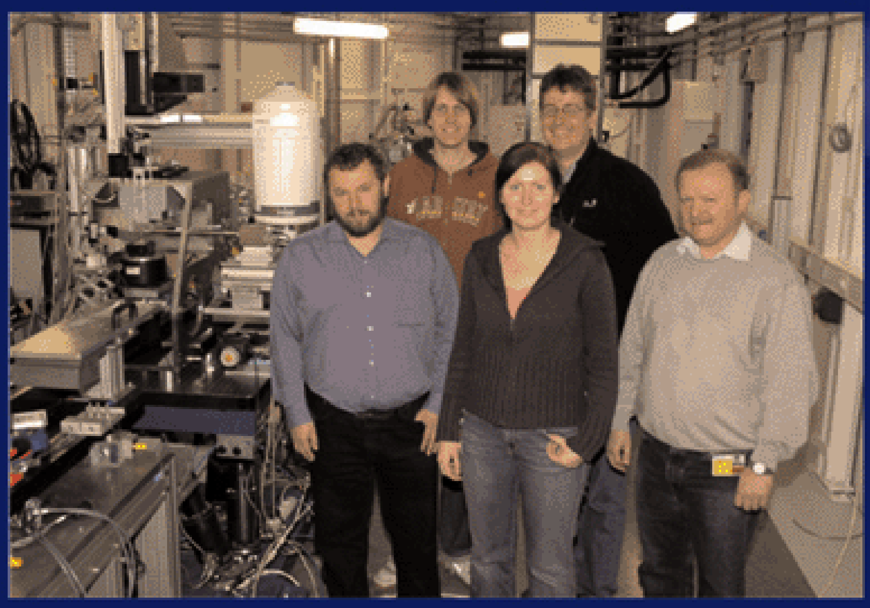
LONG BEAMLINES FOR NANOBEAMS



The two teams on ID11 and ID13.

Two experimental stations of the ESRF have been extended with the aim of carrying out research at the nanoscale. They are considered pilot beamlines for the upgrade programme of the ESRF. Their first users arrived in the beginning of March and were already nicely surprised with good news.

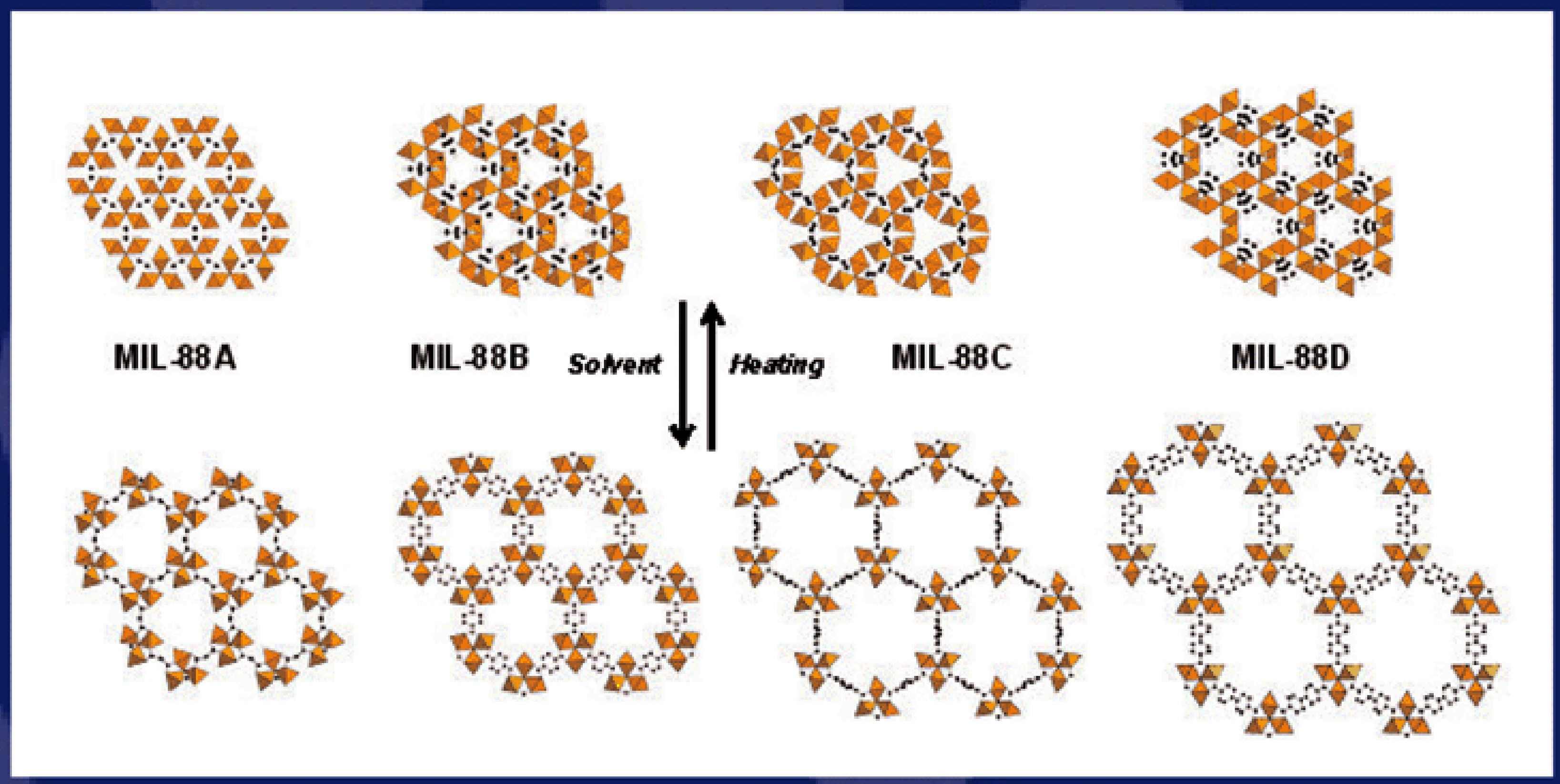
Thanks to dedication of the technical and scientific staff, the extensions of the materials science beamline ID11, led by Gavin Vaughan and the microfocus beamline ID13, led by Christian Riekel have already had the first users. After 6 months of construction, the two beamlines have doubled their length. The sample is now located at about 100 metres from the source and the beam size has reduced drastically.

The first team of the extended ID11 was a group from the École Polytechnique Fédérale de Lausanne (Switzerland), led by Marc Schiltz. As a part of a long term project with the ESRF, they were focusing on the analysis of proteins with many crystals. "It is often very difficult to grow a large single crystal for X-ray analysis, so our approach is to find a method to analyse many thousands of submicron crystals", explains Schiltz. He asserts, "so far, the data looks very promising".

Some metres further in the ring, on the extended ID13 the users were getting the beam as small as it could get. "We develop refractive X-ray lenses and a set up to diminish the beam size", explains Christian Schroer, leader of the team from the Technische Universität Dresden (Germany). The aim is to eventually integrate the lenses on the beamlines permanently, as a part of a long term project with the ESRF ID13 beamline. "For the moment we have reached 80 nanometres size, which is not bad at all", asserts Schroer.

SCIENTISTS TRACK REMARKABLE "BREATHING" IN NANOPOROUS MATERIALS

Scientists all over the world are participating in the quest for new materials with properties suitable for the environmentally friendly and economically feasible separation and recovery. A team of scientists from France, UK and the ESRF have recently discovered an unprecedented giant and reversible swelling of nanoporous materials with exceptional properties: huge flexibility and profound selectivity.



Structures (along the c axis) of the MIL-88A, B, C, D series in their dry forms (top) and open forms (bottom).

The team, from Institut Lavoisier at University of Versailles, have developed metal-organic three-dimensional structures with cages and channels (known as MIL, for Material Institut Lavoisier). These compounds contain metal ions (in this case chromium and iron), with organic linkers and are very flexible, and hence, can change shape very easily. They can open up or close down in response to external factors such as pressure, temperature, light or influence of gases and solvents. The French researchers, in collaboration with the staff of the Swiss-Norwegian beamline at the ESRF, have tracked, for the first time, a reversible giant increase in volume of these solids. It ranges from 85% of their size to up the unprecedented 230%. Such a large expansion in crystalline materials has not been observed before. This reversible "breathing" action is similar to the lungs' function in humans: they grow in size when inhaling and go back to their original size when exhaling. The lungs expand, however, by only around 40%.

C. Serre et al., Science 315, 1828-1831 (2007) and P. L. Llewellyn et al., Angewandte Chemie Int. Edition 45, 7751–7754 (2006).

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