A LIGHT FOR SCIENCE

ESRF

Materials science on the rise

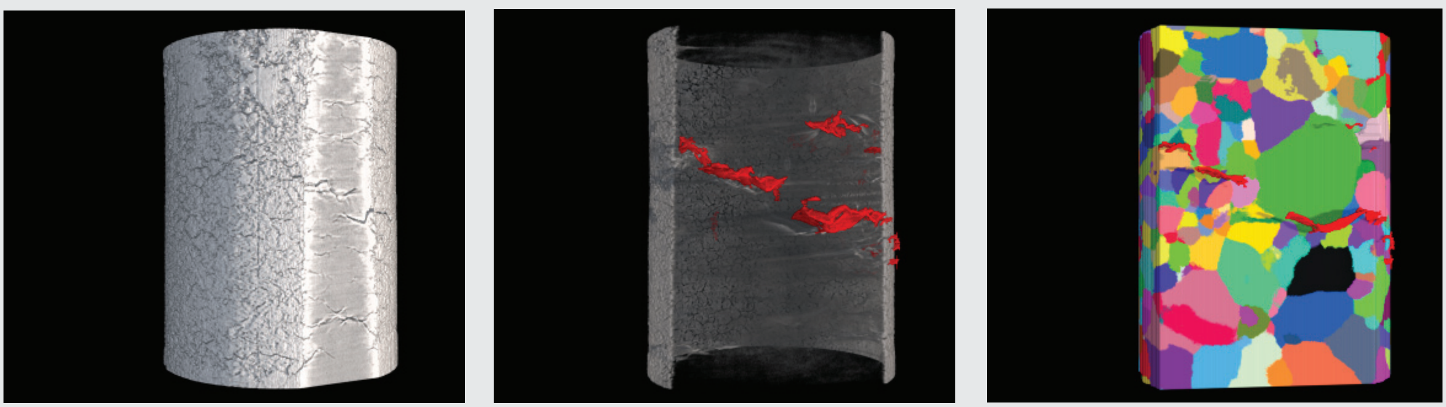
Two ESRF publications have featured in high-impact journals recently. This illustrates the role that the ESRF plays in Materials Science due to its high energy beam and competences in specialised samples.

First full 3D view of cracks growing in steel

A team of researchers from the University of Manchester, the National Institute of Applied Sciences (INSA) in Lyon and the ESRF has revealed how a growing crack interacts with the 3D crystal structure of stainless steel. It was possible to determine the internal 3D structure of the material without destroying the sample by using a new grain mapping technique.

Afterwards, a crack was initiated in the stainless steel, and the scientists were able to study how the crack grew between the grains. This is the first time that such an experiment has used the 3D grain mapping technique.

King et al., Science, 321: 382-385.

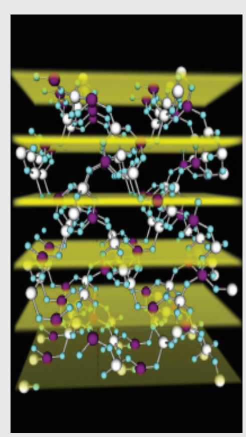


Different visions of the cracks forming in a stainless steel wire. In the first image, the sample is visible, as well as some cracks. In the middle one, the cracks inside are coloured red, and the last picture shows the different grains that make the wire, as well as the crack, superimposed, in red, that starts to form following grain boundaries. Credits: Andrew King.

Super multi-use minerals unveiled

Zeolites form around a third of the average packet of washing powder and help refine 99 per cent of the world's petrol. It is also used to clean up nuclear waste. In its natural form it originates from volcanoes but it is synthesised for commercial purposes. A team of scientists from ETH Zurich, the European Synchrotron Radiation Facility, Diamond Light source, the University of Torino and the University of Hamburg has revealed, for the first time, its chemical structure based on measurements at the ESRF. This research shows optimism for the future of zeolites. "By being able to answer the question of where the active sites are, we open the door to understanding the structure–performance relation. This will lead to ways of improving synthetic zeolites", says Jeroen van Bokhoven, main researcher.

Van Bokhoven et al., Nature Materials 7, 551 - 555.



The structure of zeolite scolecite, showing the aluminium and silicon atoms as the large sphere, connected by oxygen atoms in blue. The experiment provides the distribution of aluminium and silicon within the crystal, yielding insights into the location of the active sites in a zeolite. Credits: J. Van Bokhoven.

ESRF, BP 220, F-38043 Grenoble Cedex 9, FRANCE, Tel. +33 476 88 20 00, www.esrf.eu