NEW **CATALYSTS** FOR CLEAN, GREEN CHEMISTRY

Important challenges of the 21st century include the reduction of CO_2 emission to combat climate change, as well as the development of new materials for hydrogen storage for future energy technologies.

The Polish chemical company FAMAR in Dankowice produces chemical catalysts for industrial processes that limit the emission of harmful gases and also are useful for storage of gases such as CO_2 and H_2. Many of the produced catalysts are of unknown structures and they consist of complex mixtures of metals or metal clusters connected by rigid organic groups, for example $Mo_{10}O_{10}.(C_6H_5NH_3)_2$ and $ZnBr_2.(NH_2\text{-}C_2H_4\text{-}NH_2)_2$.

NEW WAYS TO MEASURE CRYSTAL STRUCTURES

To understand the crystal structure of these novel materials, a study within the Science Link project enabled the performance of high resolution X-ray Diffraction (XRD) at the P02 beamline at DESY in Hamburg. XRD is a technique used to measure the crystal structure of ordered materials – and information about the space groups, lattice constants and atomic positions can be extracted.

The unique nature of the synchrotron radiation produced by the PETRA III storage ring, as well as the special features of the diffractometer setup at P02, enabled for high-resolution XRD patterns to be obtained. These measurements have been instru-

mental in solving the crystal structure of many complex materials, and many features of the measured diffraction patterns were superior to those measured using conventional laboratory diffractometers. The peaks that are very close together and that usually would overlap were made distinguishable with the synchrotron source (indicated with an asterisk in Figure 1), as well as the crystal phases present in the mixture of amorphous phases that are undetectable with conventional sources. These measurements have enabled FAMAR to determine the crystal structures of many new catalyst materials for modern, clean technologies.

Figure NUMBER ONE

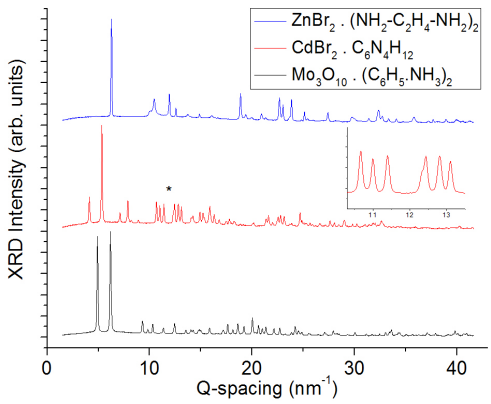

Figure 1 High resolution X-ray diffraction patterns for several compounds produced by FAMAR, measured at DESY. The inset highlights the high resolution obtained for the peaks marked with (*) which would not be distinguishable without a synchrotron radiation source.

Science Link is a network between leading research facilities of photon and neutron sources and its users. The project aims to support and encourage innovation and entrepreneurship in the Baltic Sea Region. Apart from the research facilities, the network also includes scientific institutes, universities and regional organisations that serve as service and promoting units. Science Link is part-financed by the European Union (Baltic Sea Region Programme) and involves 17 partners from 8 countries during the project period 2012 to 2014.

For further information visit science-link.eu

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Research facilities

DESY
HZB Helmholtz Zentrum Berlin
Helmholtz-Zentrum Geesthacht
Centre for Materials and Coastal Research
MAX IV LABORATORY