o.m6.o1 Strain and Residual Stress Analysis on Technical Components using X-Rays, Synchrotron X-Rays and Neutrons. A. Pyzalla, *Hahn-Meitner-Institut, Glienicker Straße 100, D-14109 Berlin, Germany*.
Keywords: industry and crystallography.

Residual stresses and texture significantly influence a component's mechanical and technological properties, especially its strength and fatigue limit. While in most cases the residual stress state in the near surface region is of particular importance there are a number of applications where a depth profile of the residual stresses or even the determination of the residual stress state throughout the whole component is required. Due to their low penetration depth residual stress and texture analysis with conventional X-rays is confined to the near surface layers or to pieces cut off from a component. A residual stress and texture depth profile can be determined within some hundred µm distance from the surface by subsequent etching and measurements.

An increase in penetration depth can be achieved using neutron diffraction, which permits a non-destructive and phase specific analysis of the three-dimensional residual stress state and the texture in the bulk of components. Thus, neutron diffraction, often in combination with X-ray diffraction, is a powerful means with respect to an optimisation of the microstructure of multiphase alloys as well as the manufacturing process and the shape of components.

Examples for engineering materials characterised and optimised by neutron diffraction and X-ray diffraction are metal and ceramic matrix composites, Ni-base alloys as well as multiphase Al-alloys, for instance. Processes and components studied by diffraction metods e.g. are cold and hot extrusion processes, shot peening, the manufactuing of turbine components. Further on, neutron residual stress analysis is used for the calibration of finite element calculations, e.g. of calculations of the residual stress state in rails and crankshafts.

Recently a new methods for microstructual, texture and residual stress analysis at the surface respectively in the bulk of components using synchrotron radiation have been introduced. These new methods are briefly presented and future trends are outlined.

o.m6.o2 Ceramic Compounds obtrained from Common Minerals. X. Turrillas. *Department of Physical Chemistry of Materials Eduardo Torroja Institute for Construction Sciences Spanish Council for Scientific Investigations (CSIC) C/. Serrano Galvache s/n 28033 Madrid, SPAIN*
Keywords: dolomite, zircon, refractory materials.

Common raw minerals such as dolomite ($CaMg(CO_3)_2$) and zircon ($ZrSiO_4$) are used to obtain refractory materials for steel industry among others. For optimizing the sintering of those ceramic materials it is necessary to understand how the reactions take place at high temperatures. In-situ neutron diffraction is an adequate technique to monitor the decomposition, crystal growth synthesis and decay of the various phases intervening during the process. In a first experiment dolomite on its own was studied by neutron thermodiffractometry in instrument D20 (ILL). Relevant crystal data were obtained after detailed Rietveld analysis of powder diffraction patterns collected on the fly while heating up to 1000 deg C. In a second series of experiments using another powder diffraction instrument of lower resolution (D1B, ILL), mixtures of dolomite and zircon were studied while being heated up to 1400 deg C. Information on the in-situ formation of $CaZrO_3$, Ca_2SiO_4 and MgO with domains of existence as a function of temperature was obtained.