

# Polymeric nanocomposites

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## Morphological aspects under external loads

Polymeric nanocomposites have become increasingly popular in the scientific community, since the first publication 30 years ago.

Due to the high surface to volume ratio of fillers with dimensions in the nanometres range, already a small amount of such fillers influences physical properties of polymers and often enhances multiple properties at once.

Fig. 1: Wide angle X-ray diffractograms at process relevant temperatures.

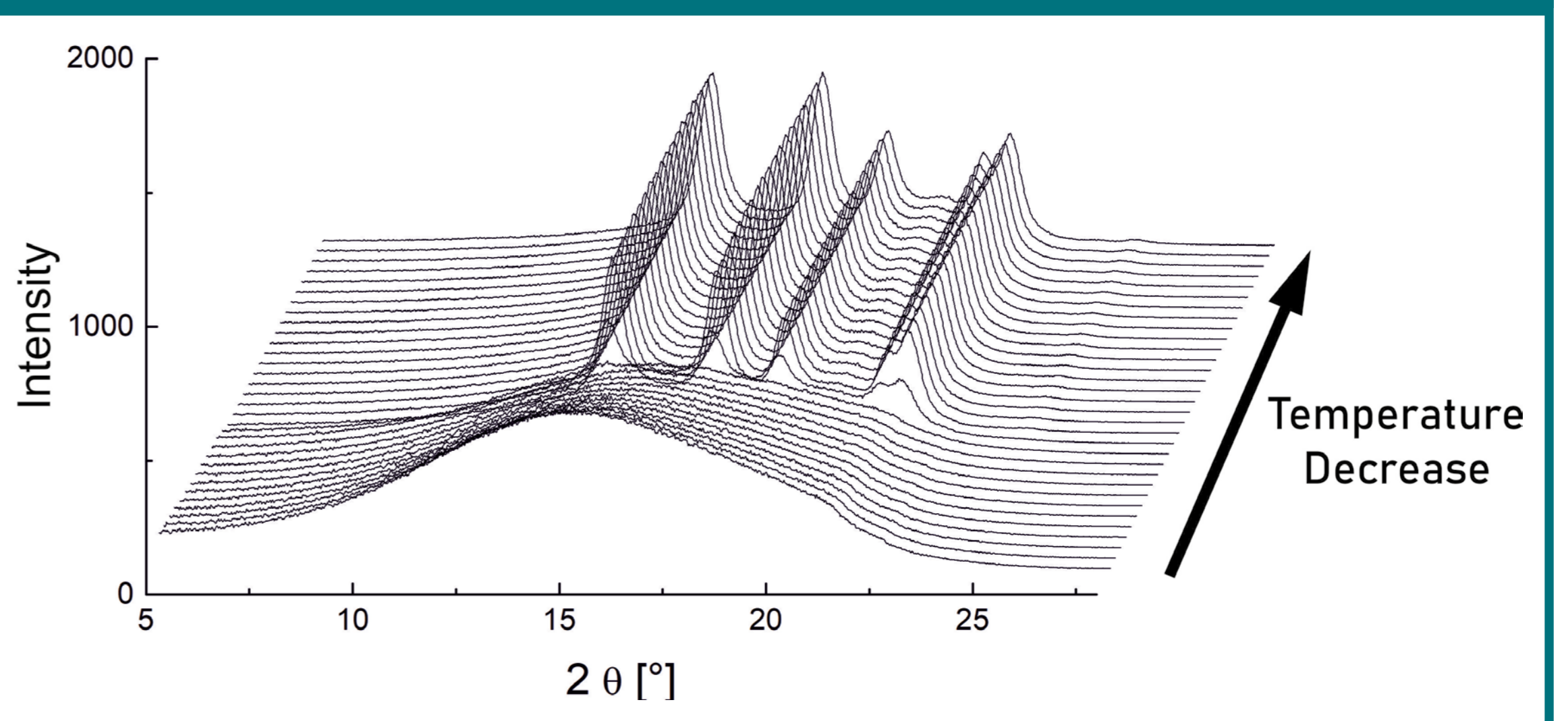
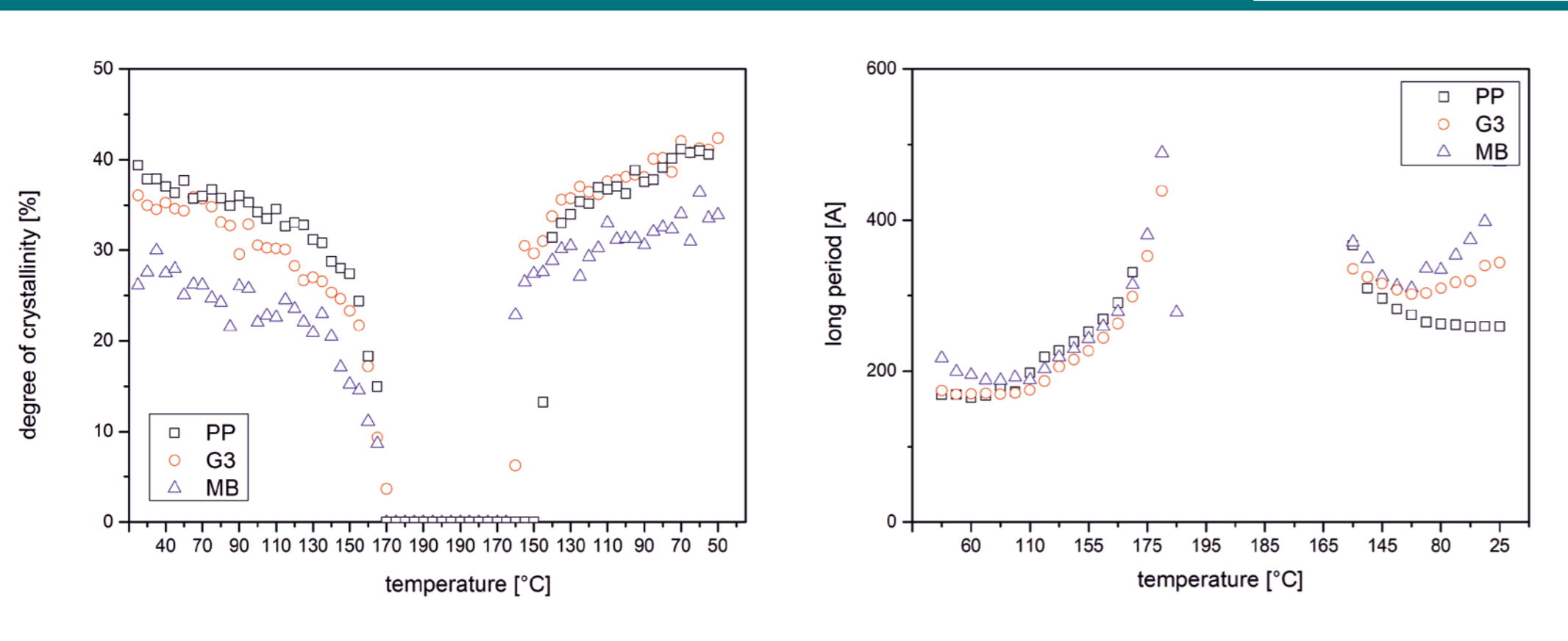


Fig. 2: Degree of crystallinity (left) and long period of the polymer (right) during heating and cooling.



Structural details and their relationships to the mechanical, optical and permeation properties of the nanocomposites are rather fascinating, because most physical parameters are triggered by an arrangement of the nanofiller in polymer matrix. In-situ X-ray techniques provide a deeper insight to structural details and their influence on the physical properties.

### Polymeric Nanocomposite Corresponding Polymer

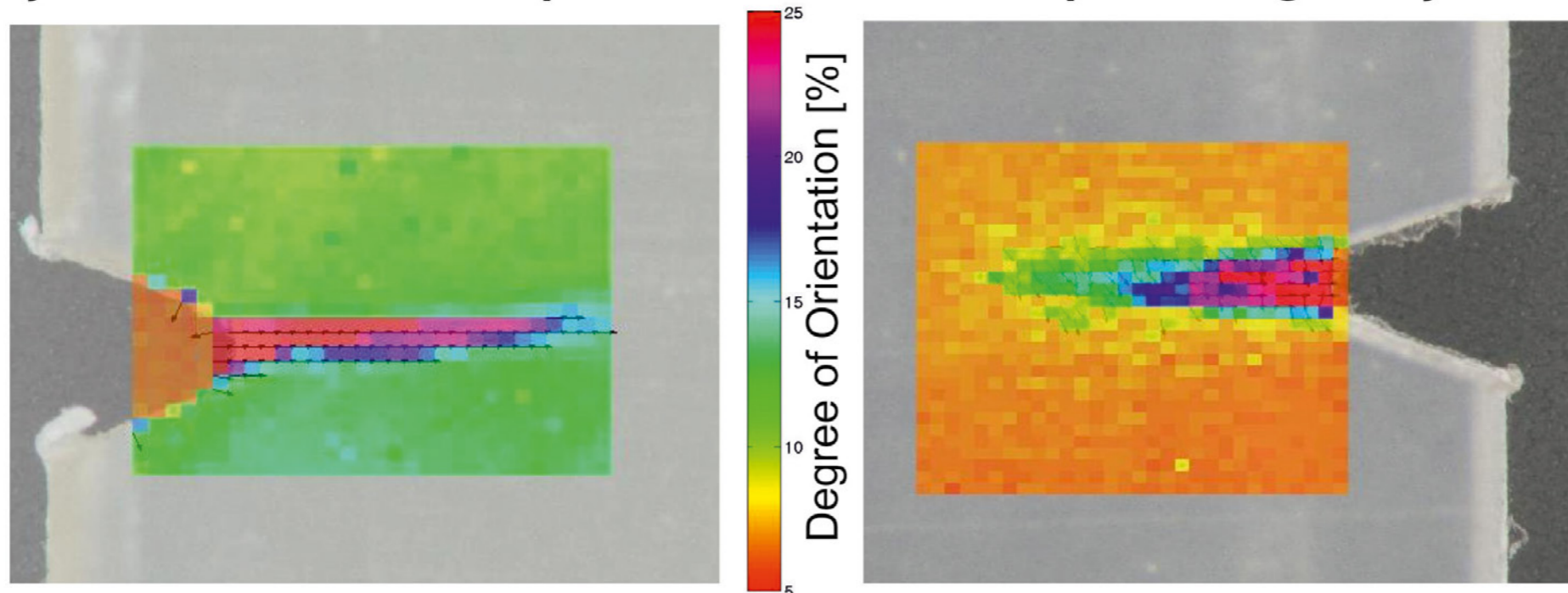


Fig. 3: Orientation parameters around a crack tip of mechanically loaded samples.

Fig. 4: Determination of crystallographic elastic constants of polymeric nanocomposites.

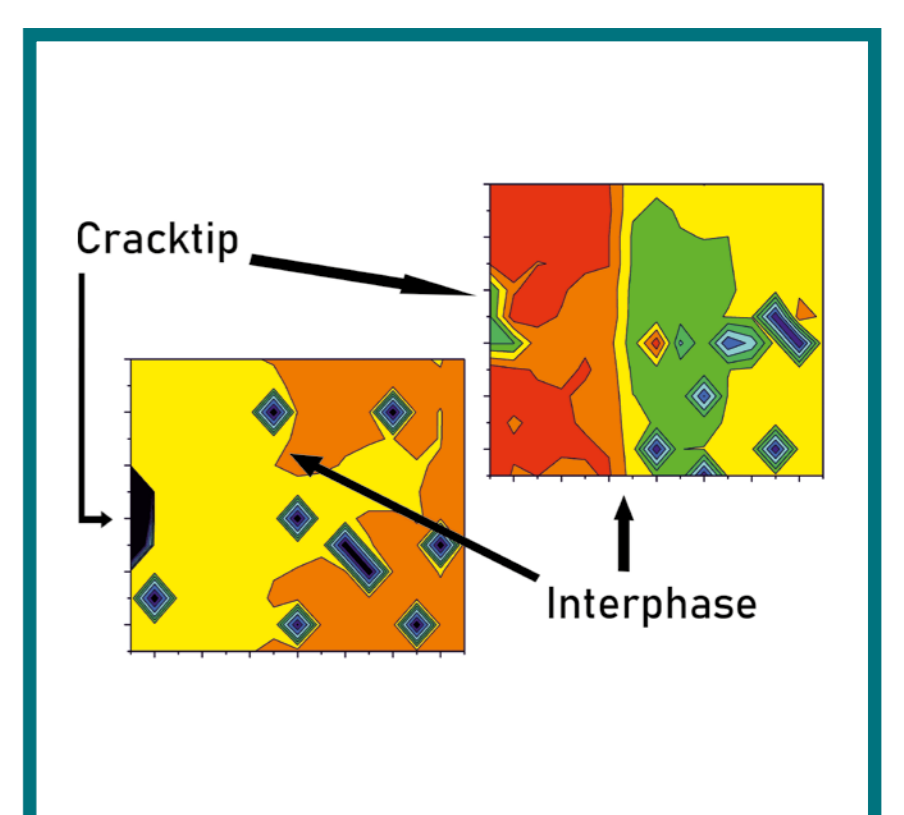
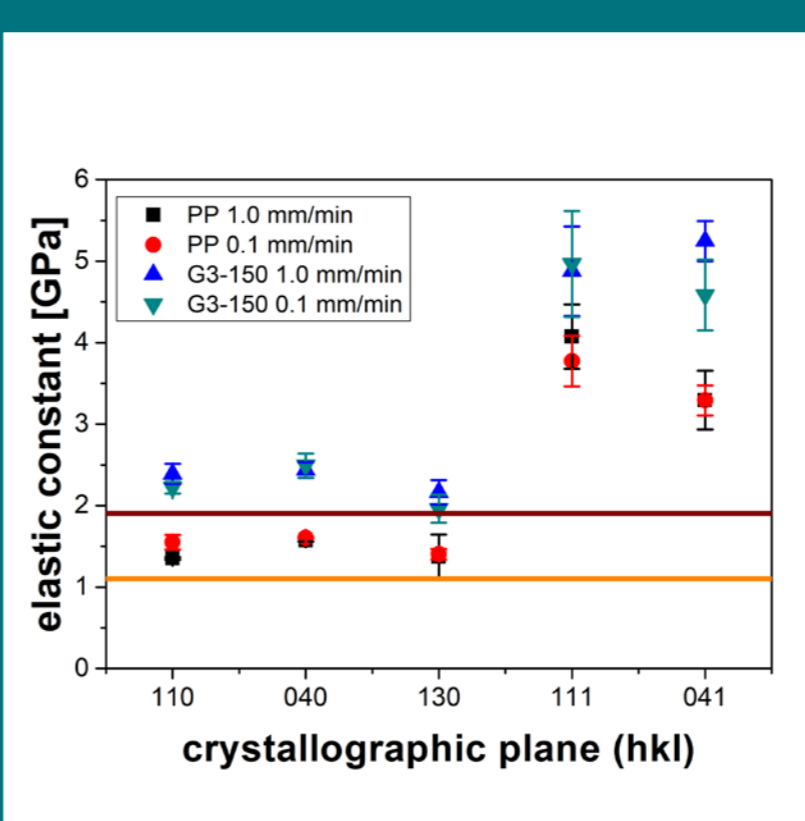


Fig. 5: Lattice strains through a polymer-polymer interphase under mechanical load.



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**RESEARCH FOCUS:** polymeric nanocomposites, recycling of polymers and composites, morphology analysis with X-ray scattering, advanced dynamic mechanical analysis

**PROJECT:** different research projects

**FUNDING:** different programmes (Austrian Research Promotion Agency (FFG); Austrian Science Fund (FWF))