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SILVER BEHENATE UNDER PRESSURE: A PRELIMINARY STUDY

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Silver behenate, $CH_3(CH_2)_{20}COOAg$, a white plate-like powder, belongs to the family of fatty acid silver salts with the general formula $CH_3(CH_2)_nCOOAg$ adopting even n values. It is used in thermographic and photothermographic imaging processes [1], as described in many patents (see *e.g.* [2]). 15 years ago it was proposed for use as low-angle diffraction standard [3] as well as for wavelength calibration in SANS experiments [4]. Its powder pattern displays twelve strong regularly-spaced diffraction lines in the low angle region (1.5-18.2°) for CuKα. The crystal structure of silver behenate is unknown, but its large lattice spacing was determined with high accuracy to be 57.380(3) Å [3]. Despite the lack of structural information, silver behenate is frequently used in recent years as above mentioned calibration standard. Combining this standard with another (more classical, *e.g.* LaB_6 [5]) one is known to lead to improved calibration owing to full coverage of the broad angular range.

Silver behenate is known to undergo several phase transitions above the room temperature [6]. Up to now the behaviour of this material under pressure remained unknown. We have performed diffraction experiments up to 11.15 GPa, using a miniature diamond anvil cell (D'Anvils) and a membrane driven diamond anvil cell (DIACELL). The silicone oil was used as pressure transmitting medium (PTM) in the first experiment, and a 4:1 methanol-ethanol mixture in the second one. The data were collected at I711 beamline using the wavelength 0.8773 Å.

In the first experiment, there is no substantial change in the $00l$ diffraction lines (see Fig. 1). These lines become weaker and broadened with increasing pressure and those at the highest angles tend to disappear gradually in the 5-11 GPa region. At the end of this range the lines with $l > 9$ disappear completely. After release of pressure from the maximum 11.15 GPa value i) these lines return to almost the same (marginally lower) angles in respect to the starting positions; ii) the lines with $l > 9$ are not restored. The behaviour in the second experiment is qualitatively similar.

High-angle lines remain unchanged in the low pressure range up to 1.3 GPa (first experiment). At about 2 GPa they tend to broaden and overlap. This behaviour is thought to be dependent on the selection of PTM material. The broadening is weaker in the second experiment.

The interplanar spacing shortening in the studied pressure range along [001] direction is 2.8%.

There is no clear indication of phase transitions in the studied pressure range. However, the observed non-smooth variations in the $d(p)$ slope and appearance of several new (weak) reflections may indicate some marginal structural changes.

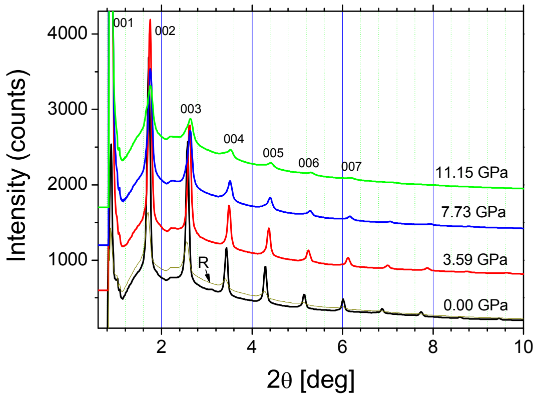

Figure 1. Selected powder diffraction patterns of silver behenate, collected at high-pressure conditions. The curve denoted by "R" refers to diffraction data collected after the release of pressure.

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