



These results may be explained on the basis of the following simple picture, taking into account that in **Run A** and **Run B** the pressure medium probably went out of the hole of the gasket when the cell was closed (this is a problem commonly encountered in HP experiments). For true (or quasi) hydrostatic conditions, the powdered sample of β -Ta remains crystalline under pressures up to at least 11 GPa. Within this pressure range, it presents a diffusive-transition around 2.5 GPa (see below). While for non-hydrostatic conditions, the host-guest structure of β -Ta collapses and the sample either becomes “nanocrystal like” or “amorphous-like”, producing a diffraction pattern with a halo characteristic for glasses or amorphous materials (see Fig 1a). The observation of two different behaviors, depending on the hydrostatic conditions, is not new and has been observed for many different systems.

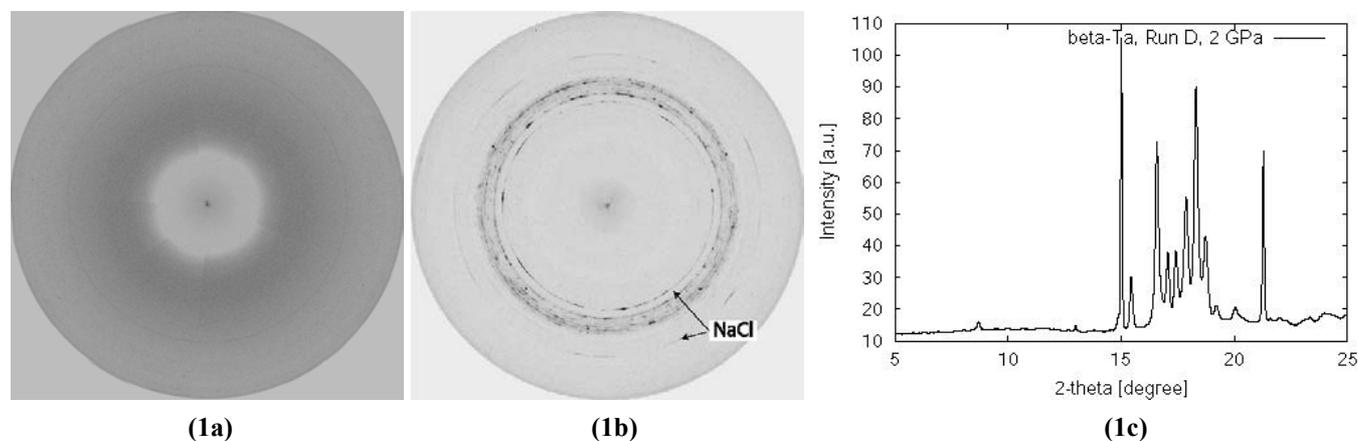


Fig. 1. Raw diffraction patterns, (1a) recorded in **Run F**, (1b) in **Run D**. A typical 1D powder diagram is given in (1c).

The powder data collected in **Run D** and in **Run E** may be indexed by the tetragonal cell of β -Ta [1]. The metric remains tetragonal over the whole range of investigated pressure, but a discontinuity is observed as depicted in Fig 2a. Inspecting the raw data close to the singularity, one can show that at 2.3 GPa some of the powder rings present radial streaking that may even bridge together powder rings (Fig 2b). When the pressure is further increased to 3.4 GPa, this streaking diminishes (Fig 2c). This observation of streaking reveals the existence of disorder and allows establishing the diffuse character of the transition. A detailed analysis of these HP powder diffraction data is in progress.

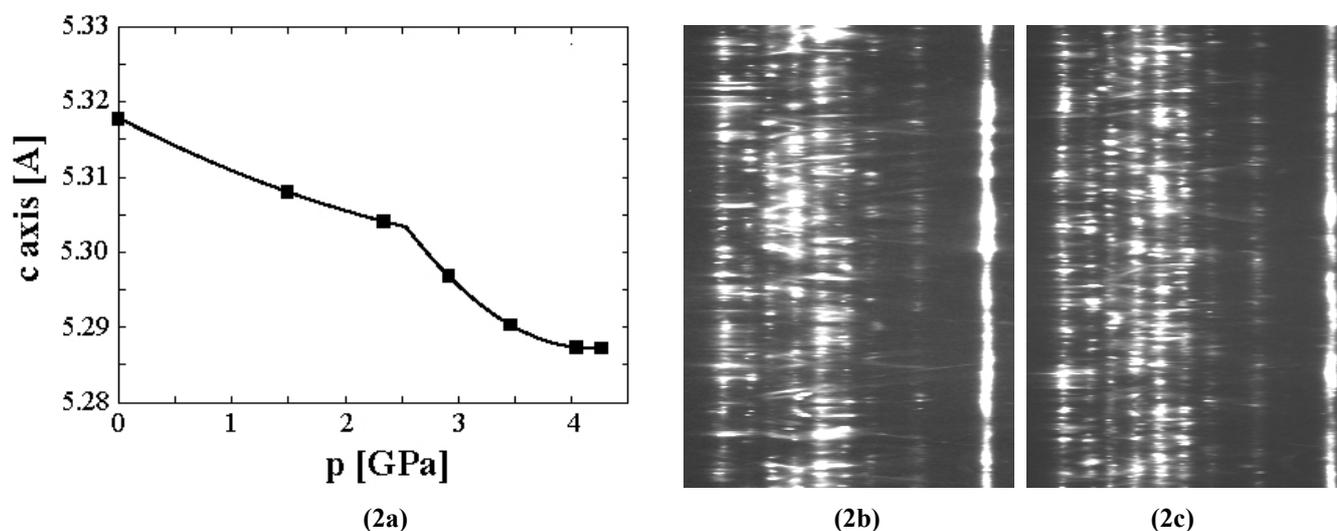


Fig. 2. The evolution of the c lattice parameter is given in (2a). Azimuthal representations of the raw images collected at 2.3 GPa (2b) and 3.4 GPa (2c) showing a stronger streaking effect just before the transition. The vertical axis is the azimuthal angle, while horizontal one corresponds to 2θ .

References

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