Rochelle Salt – A Structural Reinvestigation with Improved Tools

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Rochelle salt (RS), $NaKC_4H_4O_6 \cdot 4H_2O$ is the oldest and was for a long time the only known ferroelectric. It is unusual in that it has two Curie points. RS has been the subject of numerous diffraction and spectroscopy studies over the past 60 years. All published crystallographic indices indicate deficiencies in the data, presumably as a result of the relative instability of the crystals.

Like many other hydrates RS is unstable and deteriorates easily, either by dehydration or liquefaction when exposed to relative humidities (RH) outside the stable range. Dehydration is initiated very quickly and appears to accelerate under exposure to X-rays. Because of this extreme sensitivity to X-rays it is not possible in practice to obtain good diffraction data for RS without conditioning the environment of the crystal and speeding up data collection.

We have developed a gas-flow thermostat sample cell with control of RH, equipped in addition with a transparent rotatable capacitor for the application of an electric DC field in a fixed crystallographic direction on the sample during the experiment [1]. With this cell we were able to collect excellent data both for the high-T paraelectric and the ferroelectric phases using synchrotron radiation. The latter phase undergoes a fast and apparently irreversible transformation under X-radiation. We have also acquired data for this phase. The new data enable a study of these structures with unprecedented precision.

[1] Mo F., Ramsøskar K., 2005, *manuscript in preparation*.

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