4.3 Eight nm Domain Wall Width of 180° Domain Walls in Ferroelectric Tri-Glycine Sulphate Crystals

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Splitting of ferroelectric crystals into domains is a bulk phenomenon. However, many investigation methods rely on observations of intersections of domains or domain boundaries with crystal surfaces. Among them scanning force microscopy (SFM) is one of the most powerful methods. Operating the SFM in the different modes of imaging allows us to obtain a contrast between antiparallel domains. Tri-glycine sulphate (TGS) has been chosen as a model material both for its suitable cleavage properties and the wealth of previous knowledge about its domain properties.

We have found that antiparallel domains - identified by their lenticular shape - are discernible in both the non-contact mode and the friction force mode of imaging. To explain the differences in image contrast we take into account both forces of topographic origin and those connected with spontaneous polarization. Higher resolution studies made it even possible to evaluate the upper limit of the domain wall thickness at the sample surface : the measured value of 8 nm lies considerably below previous estimations which concern the crystal bulk.

On the other hand, two neighbouring antiparallel domains cannot be revealed in the contact force mode of operation, indicating that they are terminated by one and the same atomically flat plane. Additionally, contact images are found to reflect the history of the TGS crystal surface.