DEFECT-STRUCTURE CHARACTERIZATION OF $LaGaO_3$, $L_{A0.88}Nd_{0.12}GaO_3$, AND $SAT_{0.7}LA_{0.2}CAT_{0.1}$ SINGLE CRYSTALS

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Introduction

Rare-earth containing oxides are important materials, dedicated e.g. for optoelectronic devices [1-3], fuel cells [4] or substrates applied to epitaxial growth of films and multilayers [5]. The present work is devoted to three different lanthanum-containing, Czochralski-grown single-crystal oxides: $LaGaO_3$, $La_{0.88}Nd_{0.12}GaO_3$ and $SAT_{0.7}LA_{0.2}CAT_{0.1}$ (where: SAT = $Sr_{0,5}Al_{0,5}TaO_3$, LA = $LaAlO_3$ and CAT = $CaAl_{0,5}Ta_{0,5}O_3$). All of the above mentioned crystals are perovskite-like but they represent various crystallographic systems: $LaGaO_3$ and $La_{0.88}Nd_{0.12}GaO_3$ are orthorhombic (Pbnm space group) [6, 7] and $SAT_{0.7}LA_{0.2}CAT_{0.1}$ is cubic (Fm 3m+Pm 3m space groups) [8].

The aims of the study were an analysis and a comparison of the samples' structural quality, important for the growth technology development. Experiments were performed by means of a high-resolution X-ray diffraction with a beam wavelength 1.5406 Å.

Results

- The samples have a diverse crystal quality, revealed by the differences between FWHM's of the diffraction curves, various numbers of their maximas and also by size, shape and number of nodes in reciprocal lattice point maps;
- The results confirmed that $SAT_{0.7}LA_{0.2}CAT_{0.1}$ is a single crystal - the value of a rocking curve FWHM in the Fig. 1a is only slightly higher than the reference value used for our apparatus (it is ~18" arcsec), the curves in Fig 1a, b have singular maximas and there is a small node in the reciprocal lattice point map (Fig. 1c);
- In $LaGaO_3$ and $La_{0.88}Nd_{0.12}GaO_3$ crystal blocks (see Fig 2a, c and Fig. 3c) and inhomogeneity of the chemical composition (due to a diversification of the lattice parameter *d*, see Fig. 2c and Fig. 3c) were detected;
- The blocks are misoriented up to 0.3° (in $La_{0.88}Nd_{0.12}GaO_3$).

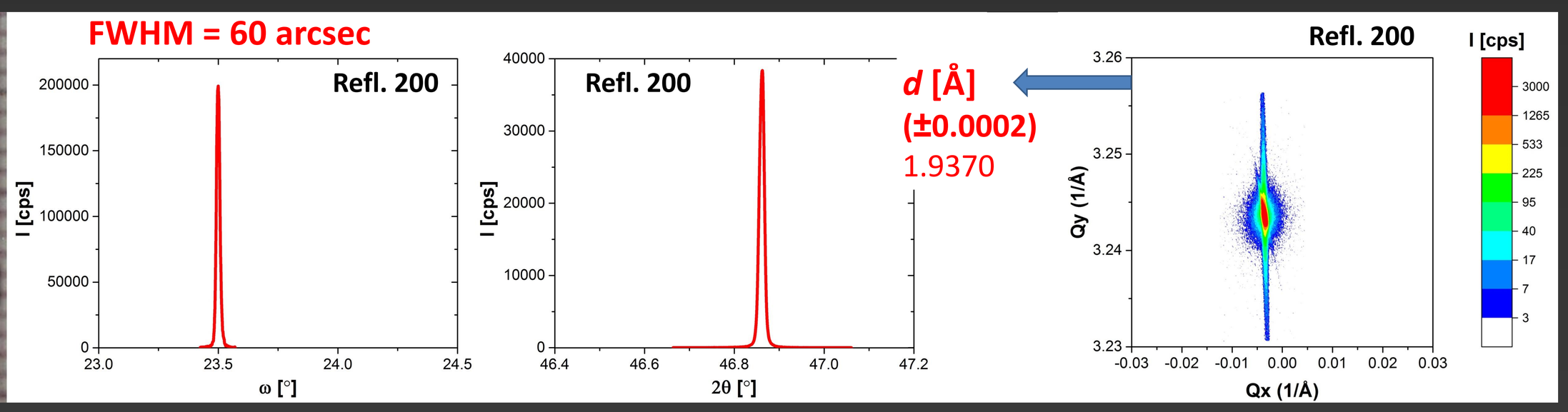
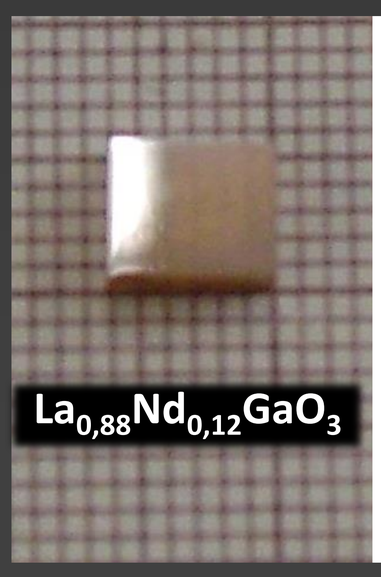


Fig. 1a Fig. 1b Fig. 1c



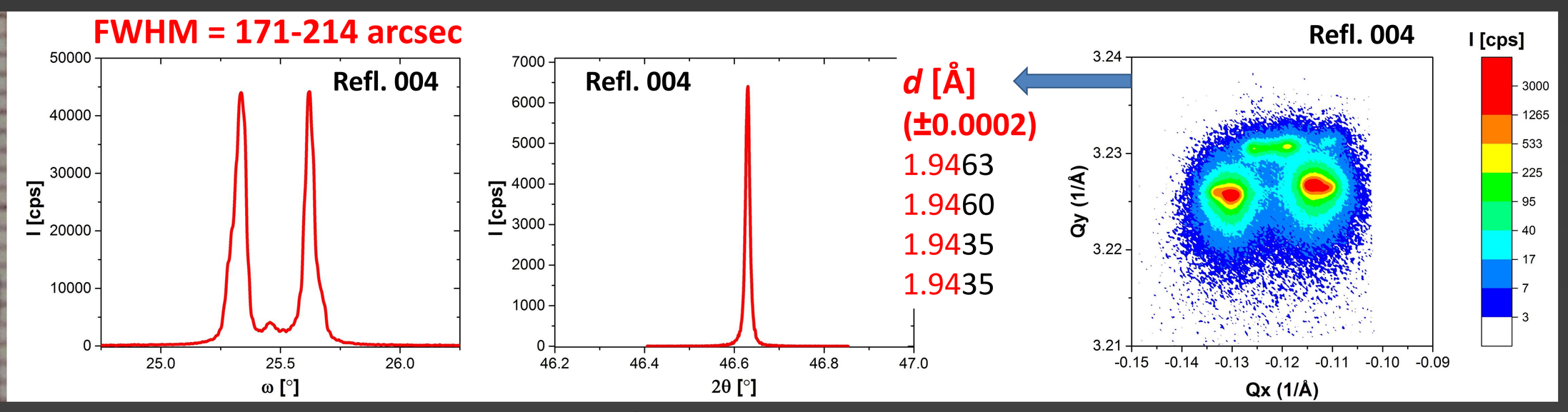
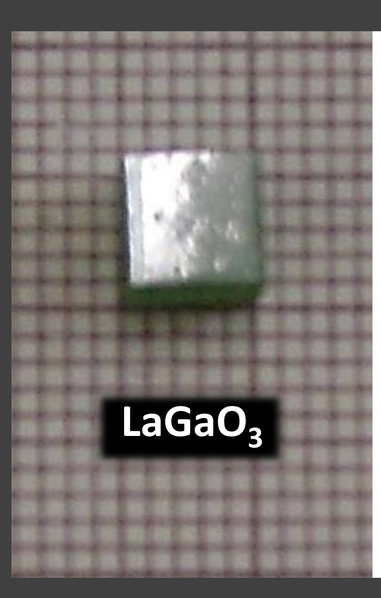


Fig. 2a Fig. 2b Fig. 2c



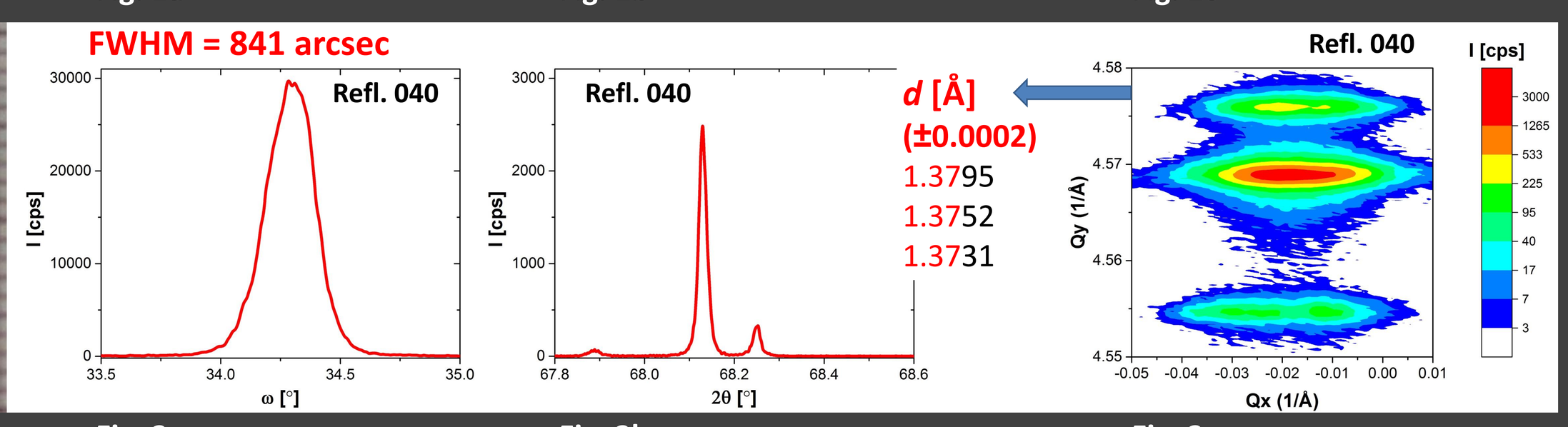


Fig. 3a Fig. 3b Fig. 3c

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