Tensor Properties of Engineered Domain Configurations in $KNbO_3$ Crystals

Jiří Fuksa, *Institute of Physics, Academy of Sciences of the Czech Republic, Prague, Czech Republic.* E-mail: fuksa@fzu.cz

Using a general method [1], [2], recently implemented in [3], we determine possible macroscopic types of engineered domain configurations of the *Amm2*-phase in potassium niobate crystals. We find that among 17 types of the domain configurations that can be, theoretically, produced by external fields there are 10 types of configurations with non-zero average polarization. It appears that electric field, possibly in combination with mechanical stress, may induce 7 non-equivalent coherent configurations formed each by equivalent domain states with same free energy in the field(s). The form of average tensor properties is given by the corresponding effective symmetry.

By examining tensor properties of the coherent configurations (CC's) we establish five cases where additional relationships between tensor components exist for certain material properties, compared to what is usually obtained for single domain crystals with same macroscopic symmetry. In one case even the stabilizer of each polar tensor of even rank differs from common expectations.

For representative CC's we specify average material tensors up to rank 4 in terms of tensor components of the same selected state.

Acknowledgements. This work was done within the project AVOZ10100520 of the Academy of Sciences CR. Financial support was provided by the Grant Agency of the Czech Republic under grant 202/04/0992.

[1] Fuksa J., Janovec V., *J. Phys.: Condens. Matter*, 2002, **14**, 3795. [2] Fuksa J., Janovec V., *Ferroelectrics,* 2003, **292**, 37. [3] Fuksa J., Janovec V., 'Conceivable engineered configurations of monoclinic Cm-phases in relaxor PZN-PT crystals', *in press*.

Keywords: engineered domain configurations, effective symmetry, average tensor properties