

6.1 Investigation of the Pseudo Spin-Glass-Systems $\text{Rb}_{1-x}(\text{ND}_4)_x\text{D}_2\text{PO}_4$ (D-RADP-X)

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In the previous report we have informed on the existence of phase segregation between ferroelectric (FE) ordered regions and glassy ordered regions in single crystals of $\text{Rb}_{0.75}(\text{ND}_4)_{0.25}\text{D}_2\text{PO}_4$ at low temperatures. The two different phase states can be distinguished by means of ^{87}Rb NMR since the corresponding transverse relaxation times T_2 differ by a factor of 4 to 6 between 140 K (onset of FE ordering) and 60 K. For the orientation $c \parallel B_0$ the spectrum of the central transition consists of two overlapping inhomogeneously broadened lines separated by 8 kHz which can be assigned to the two different kinds of local ordering. Extended ^{87}Rb 2D-measurements on D-RADP-X ($x = 0.20, 0.25, 0.30$) have been performed to obtain information on the size of the FE volume fractions and its temperature dependence for various values of x .

The behavior of D-RADP-20 is similar to a classical phase transition except for the transition region where a distribution of local transition temperatures ranging from 138 K to 153 K was observed. Below 138 K the whole crystal is completely polarized, i.e. no NMR signal corresponding to the paraelectric phase is observed anymore. Under the polarizing microscope one can observe the formation (below 138 K) and disappearance (above 145 K) of macroscopic FE domains.

The transition temperature in D-RADP-25 ranges from 118 K to 138 K. At 138 K the FE volume fraction is about 25%. On lowering the temperature this value increases linearly to about 45% at 30 K. This increase corresponds to a growth of the FE micro domains, at the expense of the glassy ordered phase. However, no macroscopic FE domains could be observed under the polarizing microscope down to 80 K. This might indicate that there is a qualitative difference between macroscopic and microscopic FE domains.

In D-RADP-30 we observe still FE long-range ordering, though only below 80 K. The FE volume fraction seems to saturate at about 25%. The remaining 75% of the crystal exhibit a glassy type of ordering similar to D-RADP-50.