

Crystallization of paramagnetic compounds in the gradient magnetic field of a superconducting magnet.

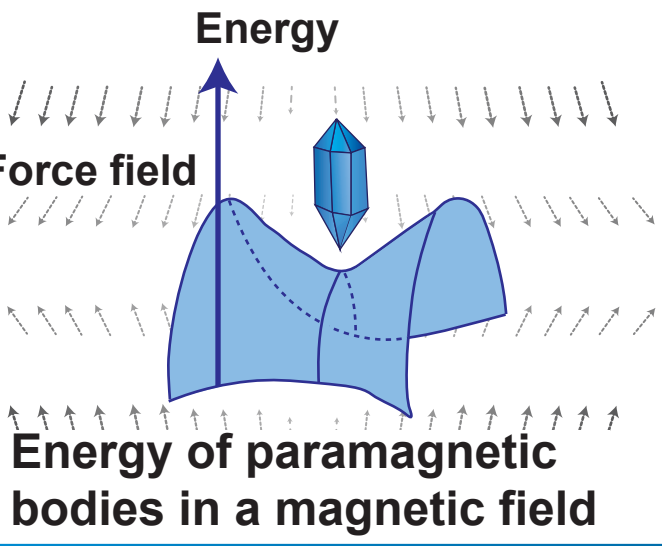
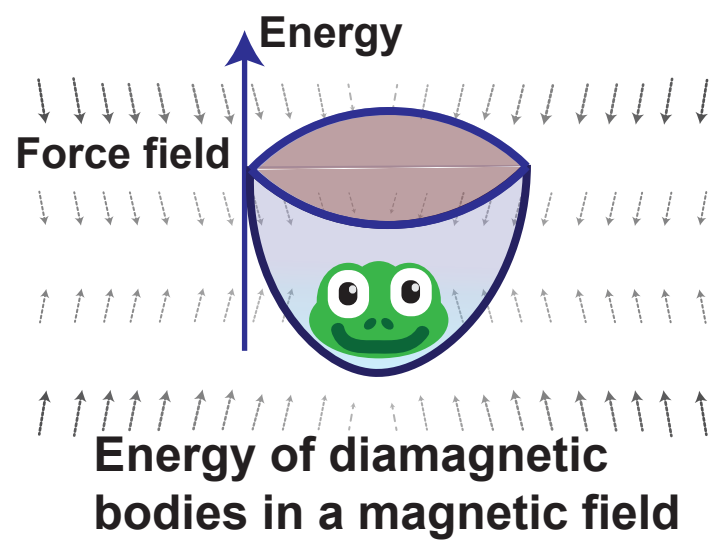
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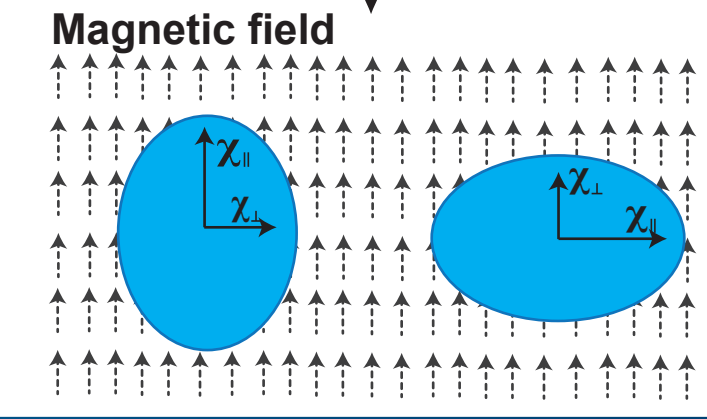
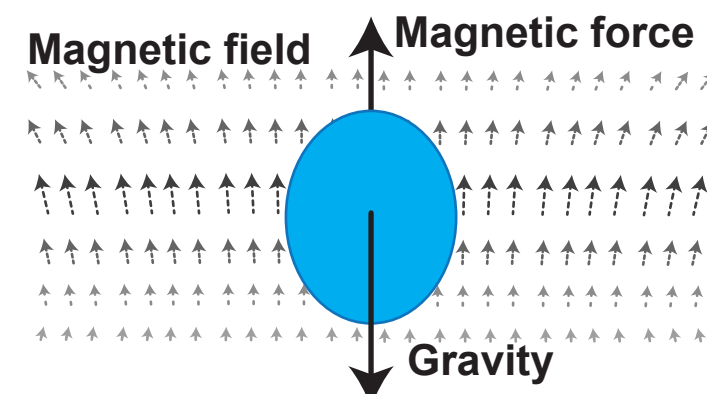
I. General Information



II. General Crystallization Features

$$\Delta F_M \sim -10^{-4} \text{ кДж/моль } (\sim 0.01 \text{ K})$$

Для $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$



• Minor corrections to thermodynamic potential

• The presence of force from the magnetic field

$$F_{\text{MH}} = \frac{(\chi_{\text{тело}} - \chi_{\text{раств}})V}{\mu_0} \nabla \frac{B(r)^2}{2}$$

• The presence of a forces moment from the magnetic field

$$E(\theta) = \frac{1}{2\mu_0} \Delta\chi V B^2 \cos^2\theta$$

III. Purpose of the work

• Development of new methods for obtaining paramagnetic compounds in the magnetic field of superconducting magnets

IV. Objectives

• To show the possibility of significant compensation of the gravity force acting on paramagnetic crystals

• To demonstrate possible directions of the development of the crystal growth method

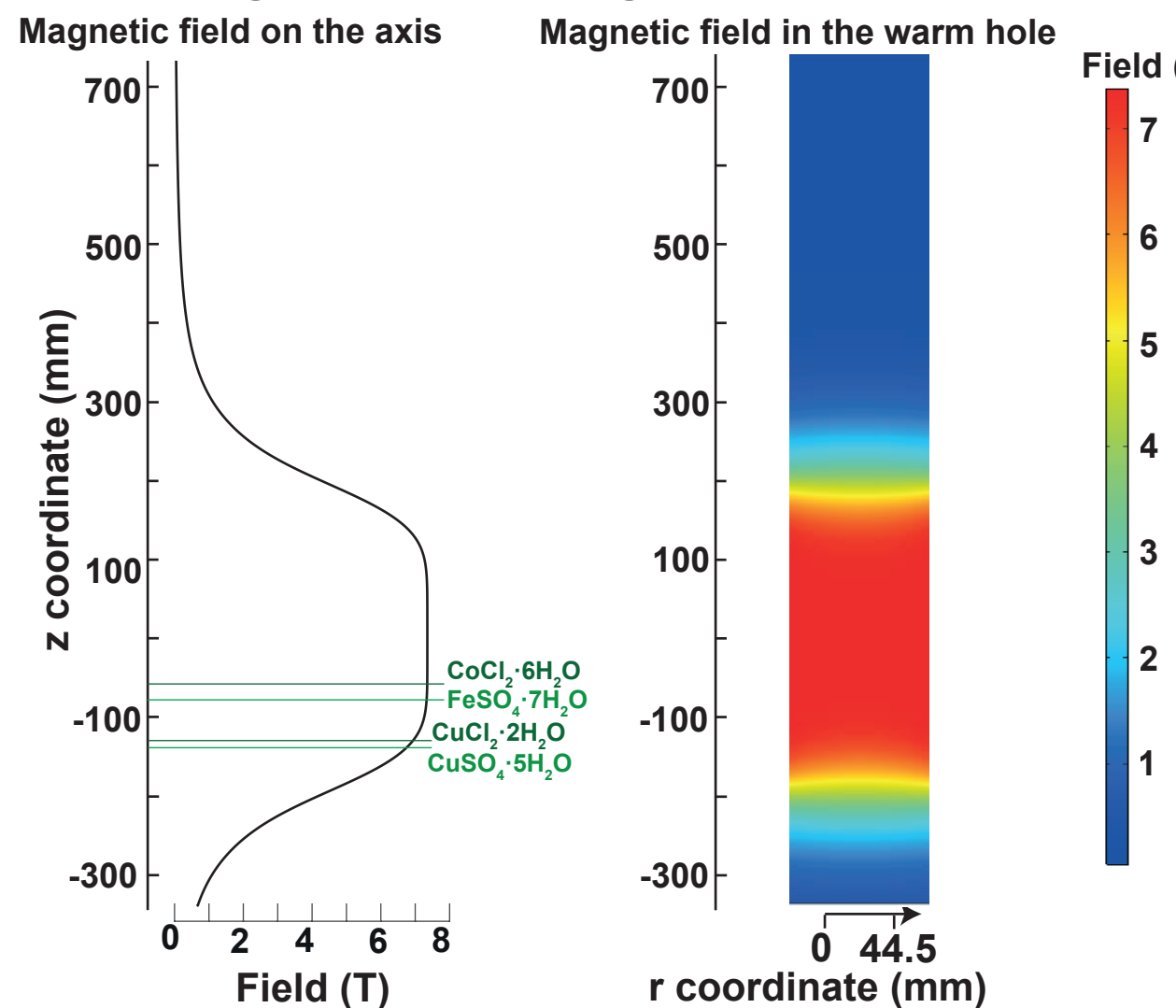
• To characterize the field profile of an NMR magnet with a proton frequency of 300 MHz

• To demonstrate the crystallization features of paramagnetic compounds in a gradient magnetic field using $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ crystals as an example

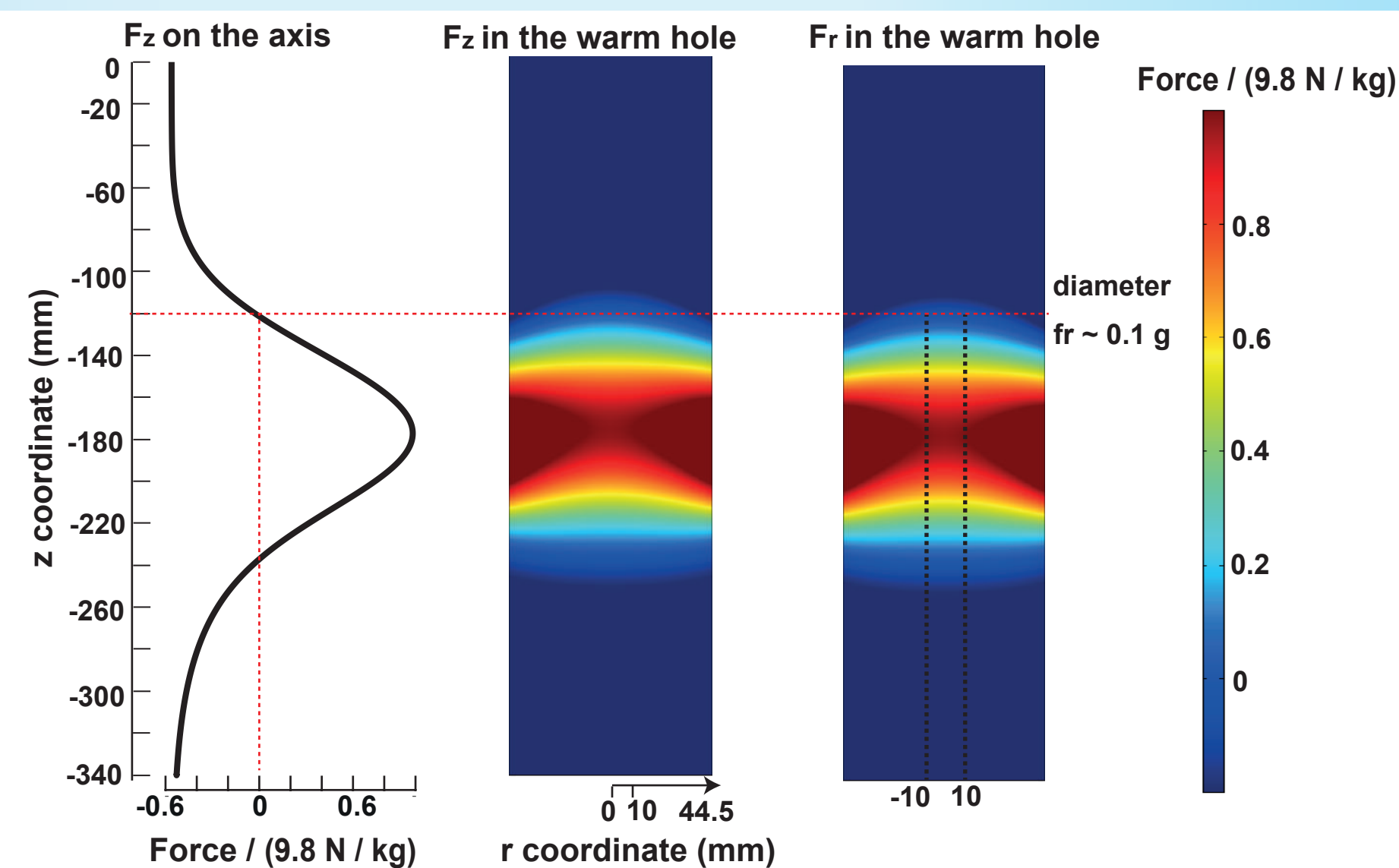
V. Features of the magnetic field distribution



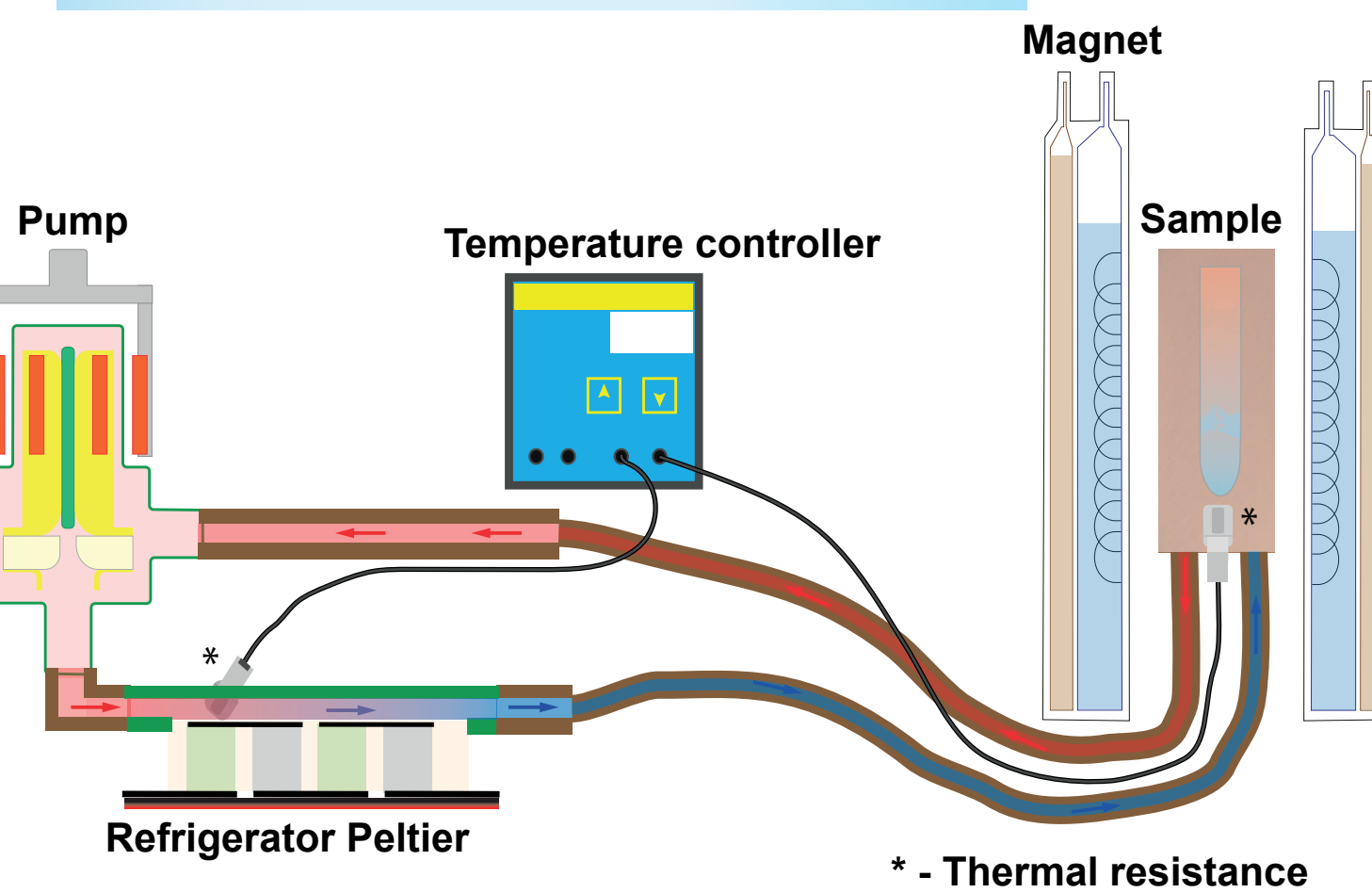
The magnitude of the magnetic field in a warm hole



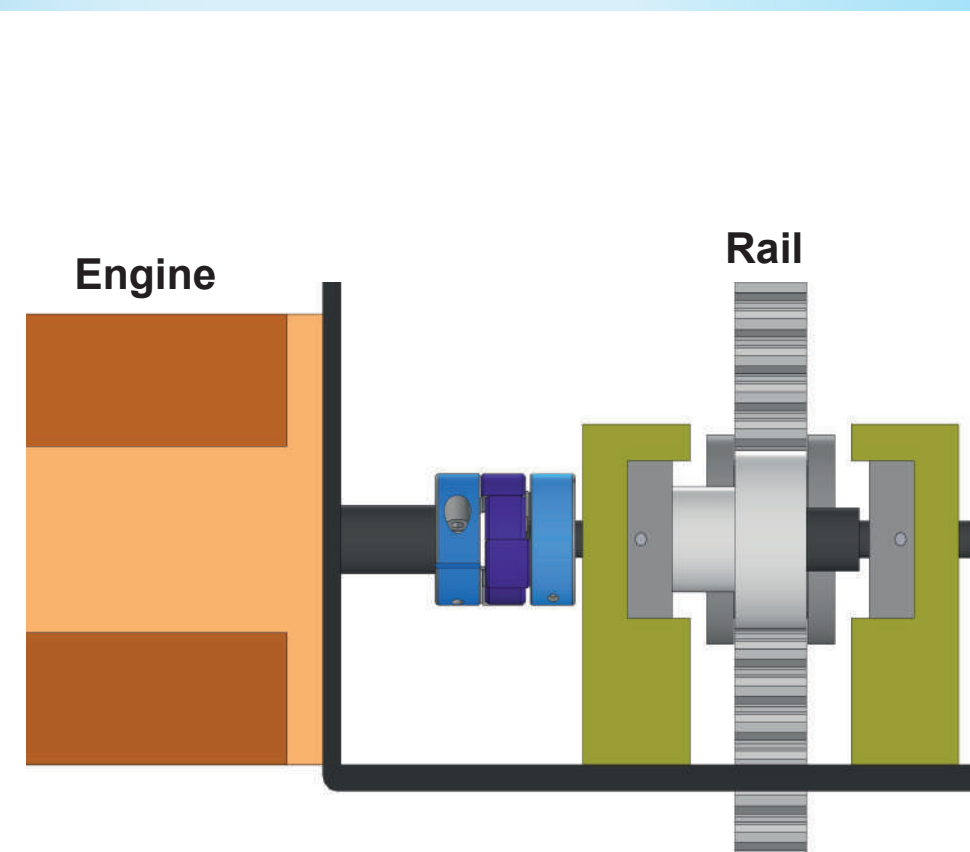
VI. Characteristics of the magnetic field strength acting on CuSO₄ · 5H₂O



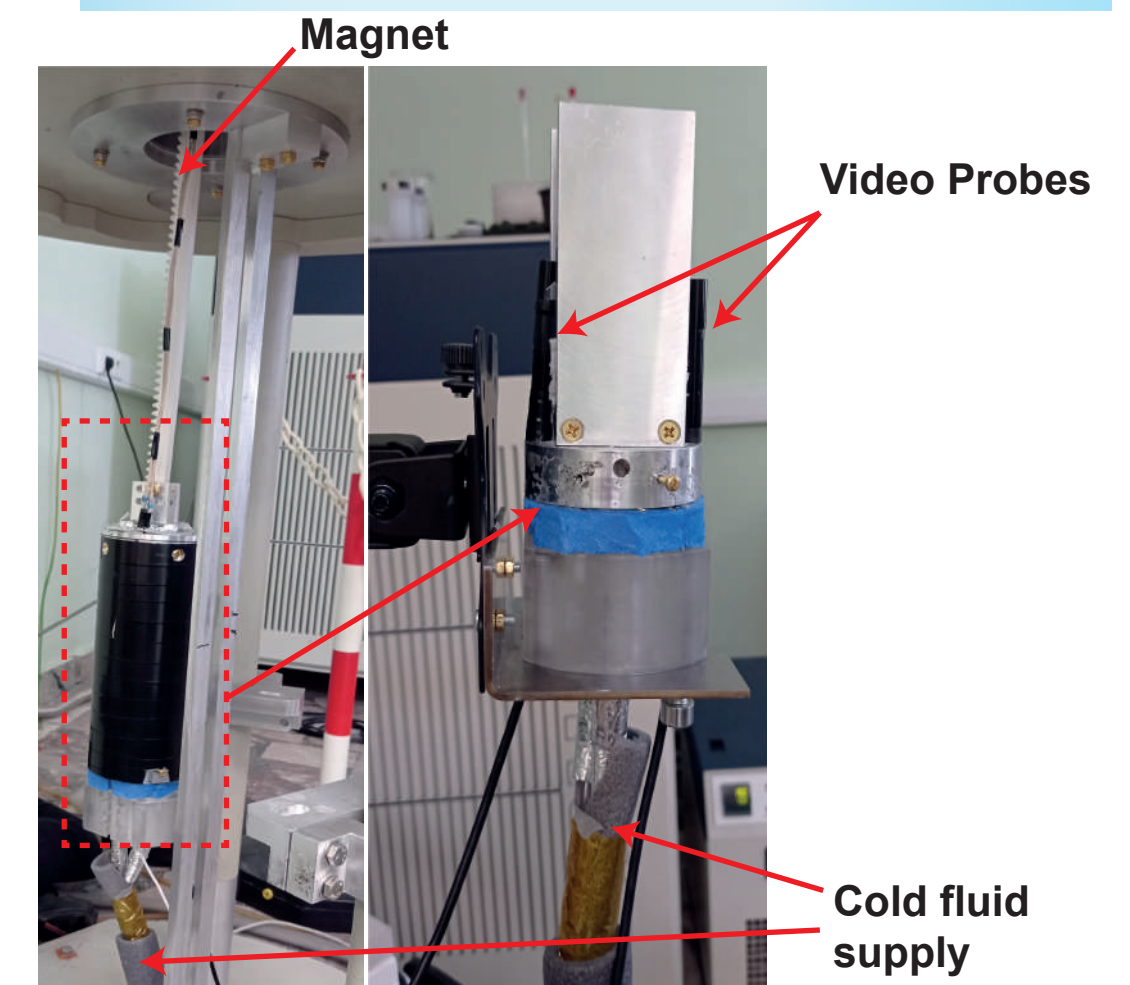
VII. Temperature control system



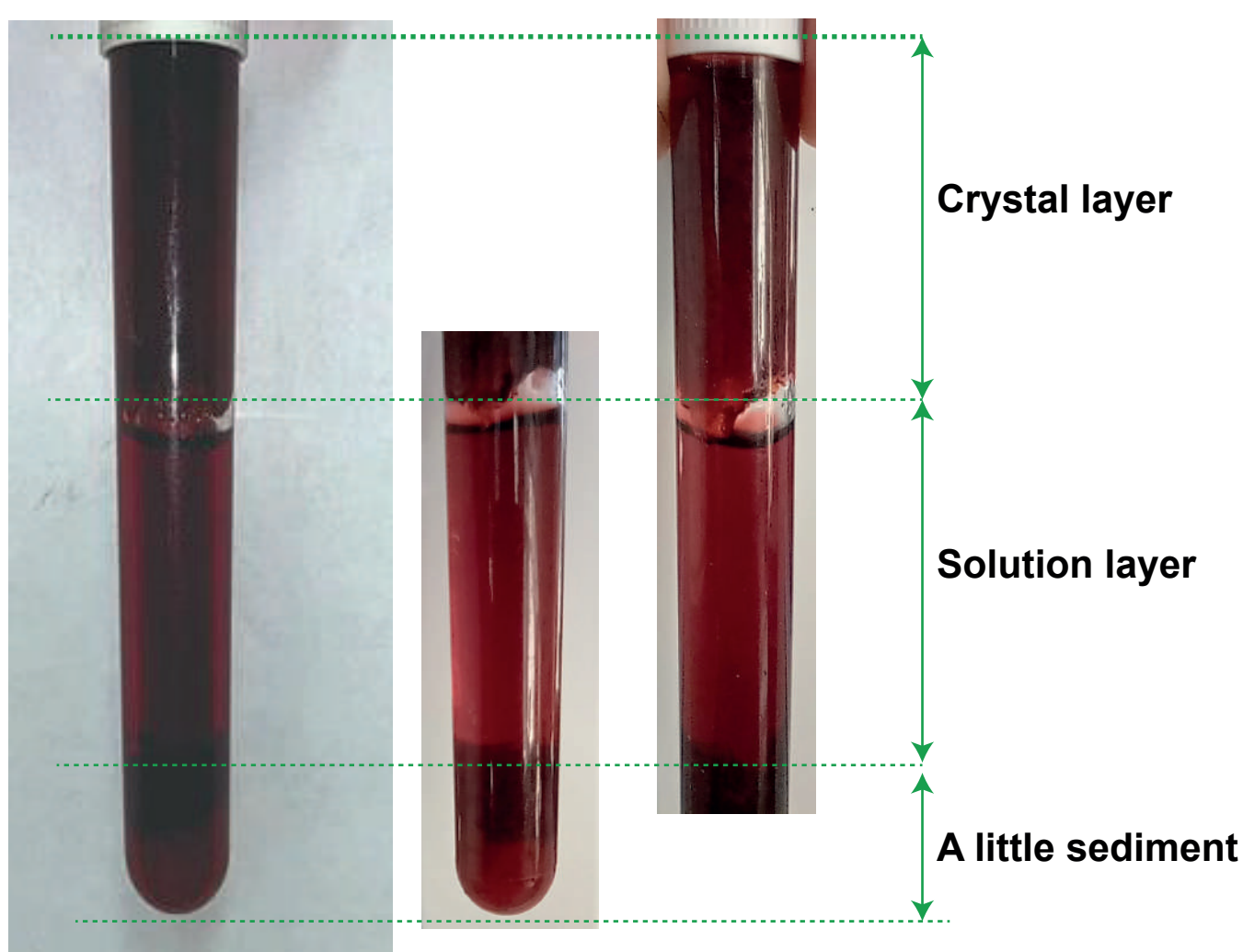
VIII. Positioning system



IX. Setup photos



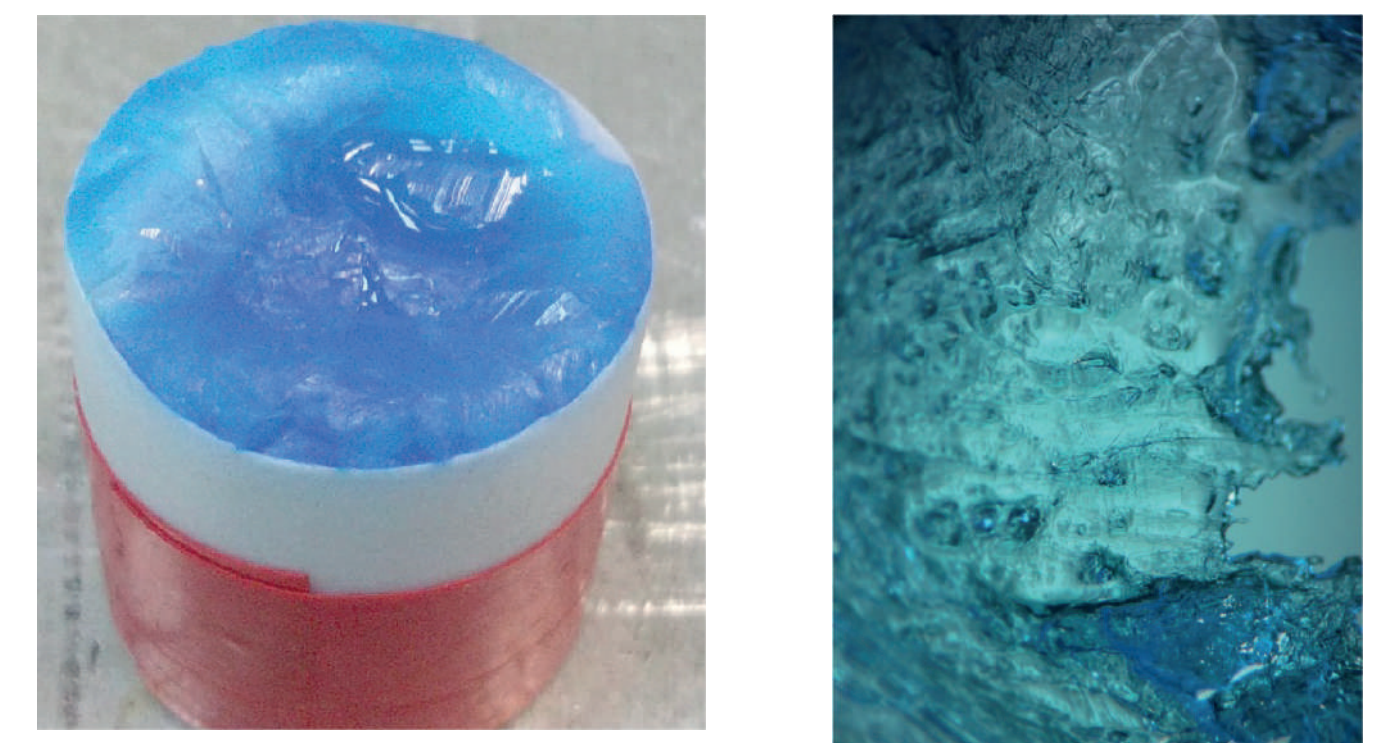
X. CoSO₄·7H₂O crystals



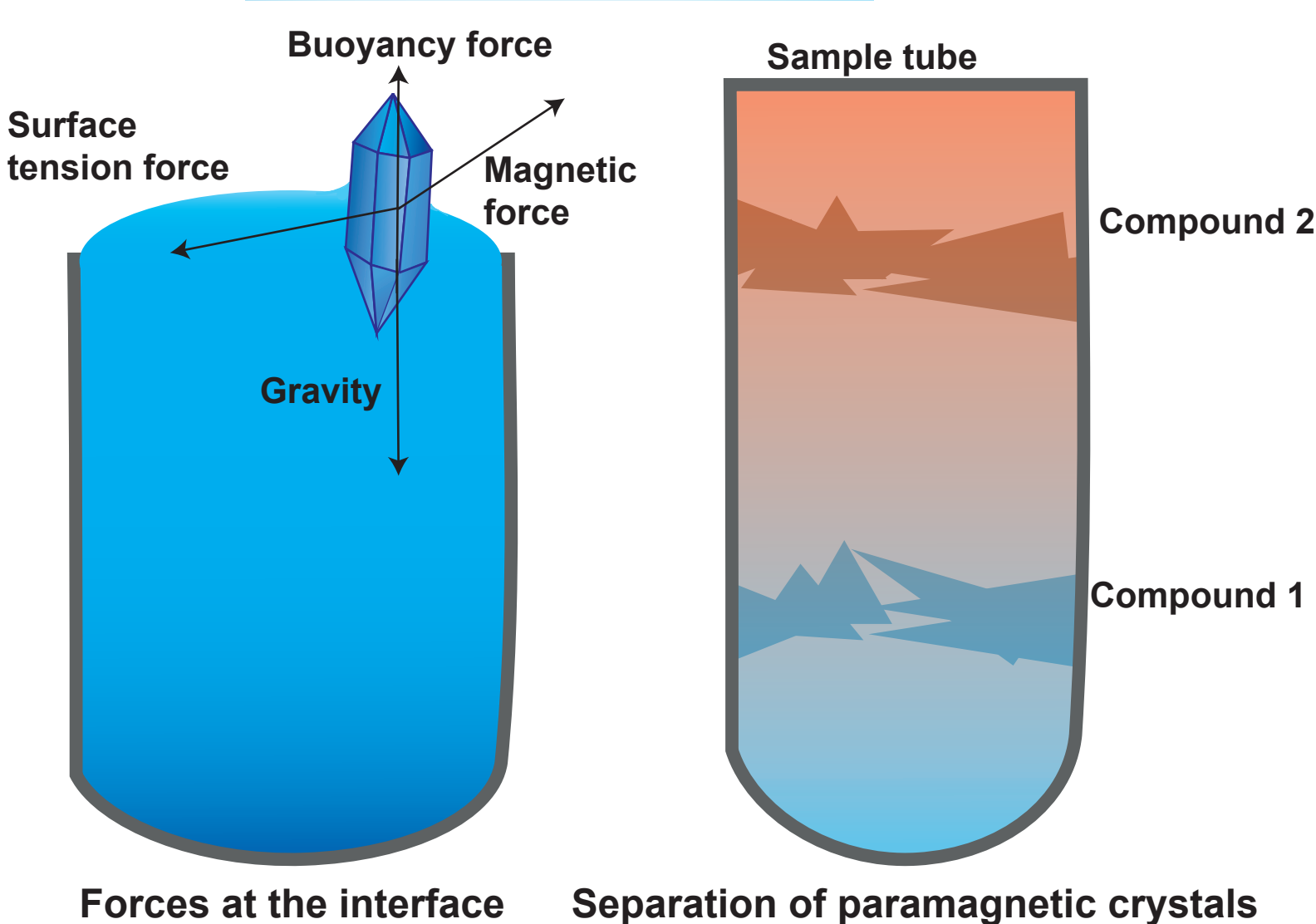
XI. CuSO₄·5H₂O crystals



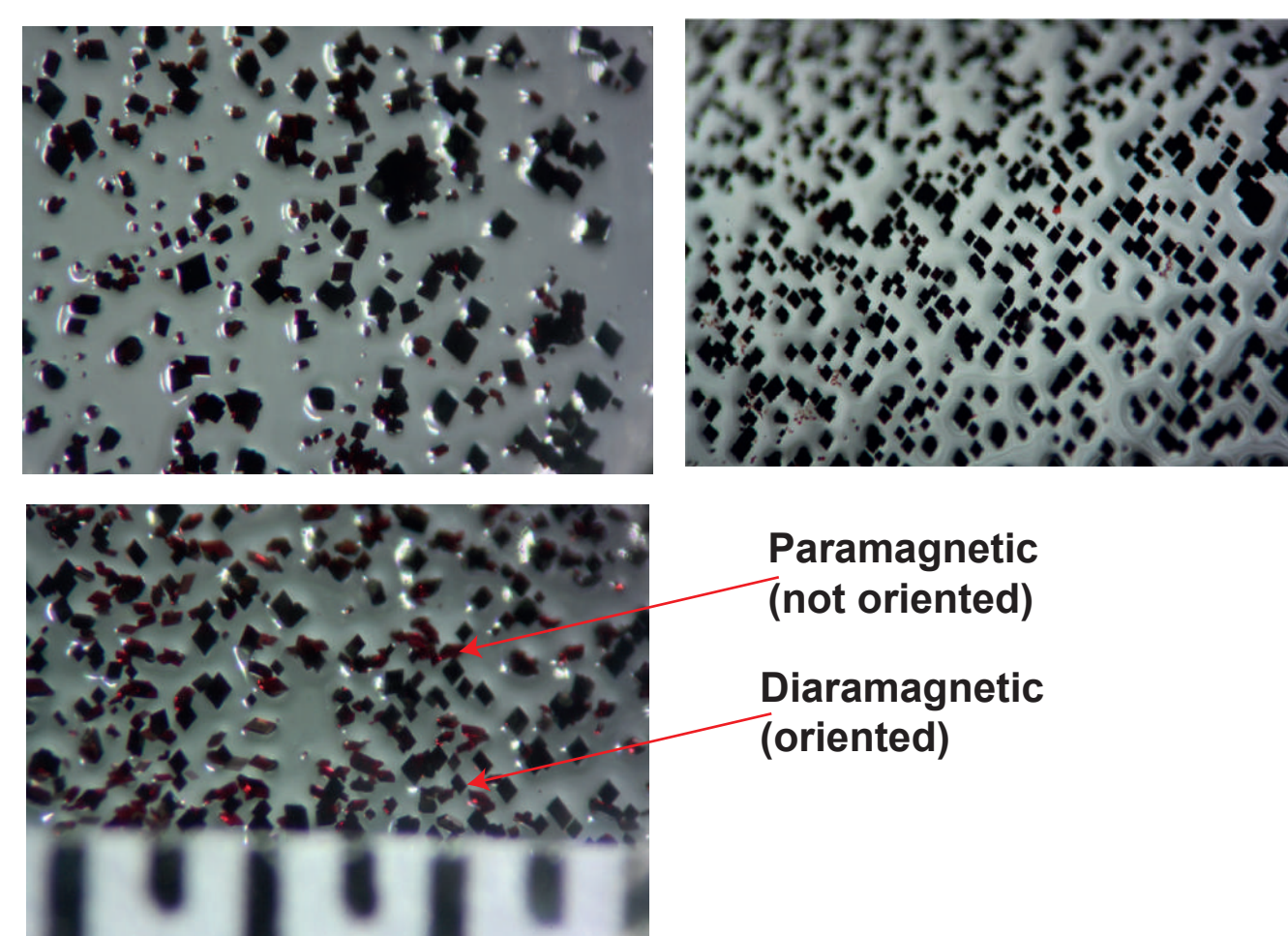
XII. Crust of CuSO₄ · 5H₂O crystals



XI. Further research



XI. Crystal orientation



XII. Conclusion

• The field profile of an NMR magnet with a proton frequency of 300 MHz has been characterized

• The possible development of method for obtaining crystals in a magnetic field has been demonstrated.

• The setup has been developed that allows controlled growth of paramagnetic crystals in the magnetic field of a superconducting magnet