

Rotor Modeling at Low Temperature for NMR

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Abstract

Our laboratory is currently leading the design and the manufacture of a novel device that allows NMR spectroscopy to be cooled down to cryogenics temperature (in the 10-100 K range). The system features a sample-holder that rotates at very high frequencies ($f > 10$ kHz). Two aerostatics gas-bearings, allows this sample holder to be suspended in its chamber thanks to a Helium flow. A second Helium flux on a rotor allows for the rotation. Due to high variation of Helium gas properties, the control process is complex.

We present the modeling of the sample-holder down to 10 K. Both the gas-bearings and the rotation are modeling as different temperatures as a function of time. The model mixes CFD, thermal and mechanical COMSOL nodes. We present the model in details as well as its results.

Figures used in the abstract

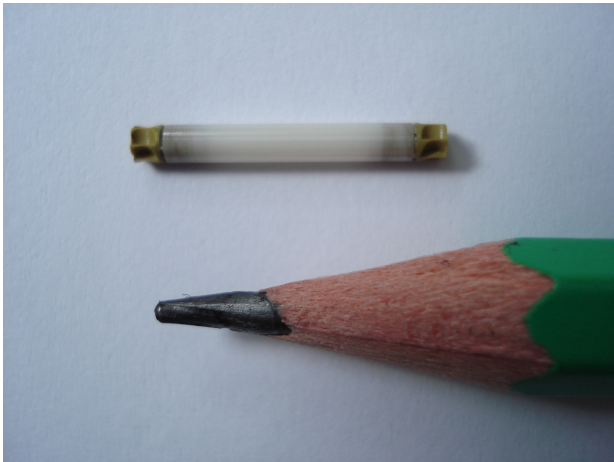


Figure 1: Sample-holder