

## Thermal conductivity of Yb:YAG ceramics in the range of 4.2 K -280 K

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Thermal conductivity of Yb:YAG ceramics was measured at the Commissariat à l'Énergie Atomique (CEA) in Saclay and the National Institute for Fusion Science (NIFS) at low temperature. A block of 9.8 at% Yb-doped YAG ceramics was used for the measurements. At NIFS, the Yb:YAG sample was broken in a cryogenic environment because of the differential thermal contract between the sample and a sample holding system, and then, the measurements could be conducted only in the range of 70 K - 260 K [1]. Hence, an apparatus with a different sample holding system in CEA was employed to extend the measuring temperature to lower temperature. Figure 1 shows the sample holding system in the CEA apparatus.

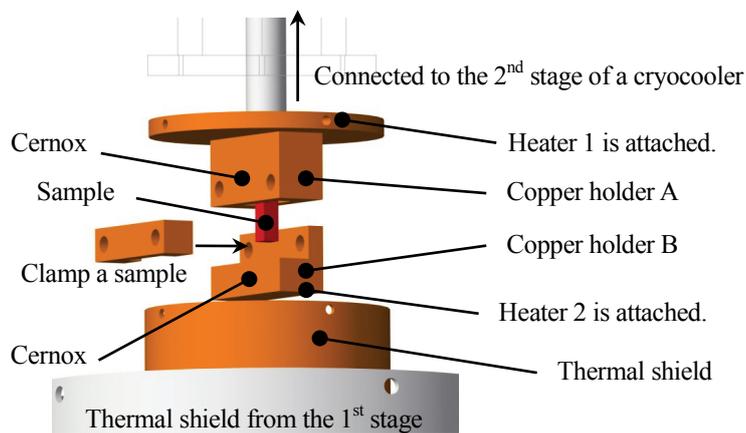


Figure 1: Sample holding system in the CEA apparatus.

The sample is mechanically clamped by copper blocks and is tightened on the copper holders with screws. Cry-Con thermal conductive grease is applied between the copper holders and the sample. This sample holding system has an advantage to be able to hold any solid material geometry. The heater 2 generates the steady state heat flow through the sample, which results in the temperature gradient along the sample. Two cernox sensors are embedded in the copper holders and measure the temperature difference across the sample. The heater 1 is attached on the copper flange to control the whole sample temperature. The system is cooled by the 2nd stage of a 4.2 K GM cryocooler.

The thermal conductivity is measured in the range of 4.2 K - 280 K. The measurements are compared with those of the previous study. We discuss the accuracy of the measurements of the CEA and NIFS apparatus.

### Reference

[1] R. Yasuhara, et al., *Optics Express*, 20 (28) (2012), 29531.