

Rheological measuring cell for UV-assisted thermal curing materials at elevated temperatures

Authors

Philipp Beutler and Cornelia Küchenmeister-Lehrheuer Thermo Fisher Scientific, Karlsruhe, Germany

Keywords

HAAKE MARS iQ Air Rheometer, oven (TM-CR-O), UV-curing, thermal curing

Thermal curing is a process widely used in industrial applications such as powder coating, adhesives, sealants, soldering materials, and inks. Recently, there has been a growing interest in replacing traditional thermal curing with UV-assisted thermal curing with the goal of enhancing product properties, boosting productivity, and reducing production costs. The use of ultraviolet light can significantly lower the amount energy required to initiate the curing reaction while maintaining the efficiency of the overall process. Additionally, UV-assisted thermal curing is more environmentally friendly, as it reduces greenhouse gas emissions and minimizes the use of volatile organic compounds (VOCs). This leads to a safer and cleaner production process.

For the development and measurement of cured samples, the Thermo Scientific™ HAAKE™ MARS™ iQ Air Rheometer offers control of high-temperature UV-curing processes in a temperature range between ambient and 200 °C. The PL20 UV lower plate UV tool is specifically designed for performing UV curing measurements in the TM-CR-O oven¹ (Figure 1), which operates within a temperature range of -150 °C to 450 °C. The lower part of the UV tool is equipped with a light guide that connects to a commercially available light source, which can be triggered by the rheometer software. Depending on the application, different UV sources such as mercury vapor lamps or LEDs are available.²

Using the Thermo Scientific™ HAAKE™ RheoWin™ Software, it is possible to program an automatic measuring routine where the sample is first pre-cured with UV light and then thermally cured using the oven. The combination of convection and radiation heating ensures rapid temperature changes and uniform temperature distribution within the oven.

Plate/plate measuring geometries with diameters up to 20 mm, made from various materials (e.g., titanium, stainless steel, or disposable aluminum), are also available to suit diverse experimental needs.

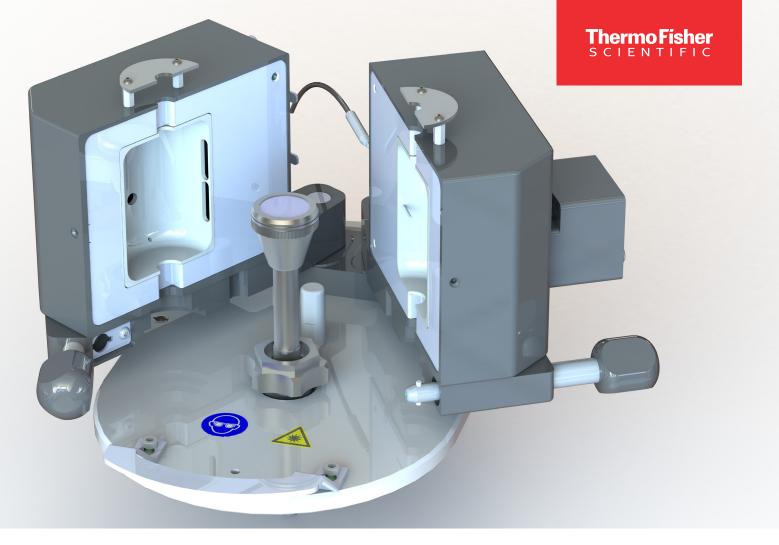


Figure 1. PL20 UV lower plate UV tool integrated into a HAAKE MARS iQ Air Rheometer oven.

Ordering information

Product	Cat. No
PL20 UV shaft (for mounting in TM-CR-O) with Borosilicate glass plate (d = 30 mm)	222-2497
30 mm Borosilicate glass plate (10 pcs.)	222-2574
Upper geometry, e.g. Rotor P20/Ti with "Connect Assist" and ceramic shaft	222-2090
or Adapter P3 for disposable plates D PXX/AI with "Connect Assist" and ceramic shaft with disposable geometry D P20/AI (40 pcs.) made of aluminum	222-2290 with 222-2154

References

- 1. Temperature chamber for HAAKE MARS iQ Rheometer series, Thermo Fisher Scientific Data Sheet D038
- 2. Ph. Beutler, Mercury vapour lamp or LED?, Thermo Fisher Scientific Product information P072



