UV Cell

The UV Cell is used to monitor changes in material properties as a result of exposure to ultraviolet or other wavelength radiation. The cell has a temperature range from 0 to 350 C. The innovative design allows the plates to be easily removed to facilitate working with vitrified samples.

The UV Cell is equipped with a lower plate made of UV transmittable material beneath which a suitable light source can be mounted for irradiation of the test sample. The upper measuring system can be made of any machinable material, including steel, titanium, glass, polycarbonate, etc.

The UV Cell is one in a series of “Application Specific” accessories for the STRESSTECH and VISCOANALYSER Rheometers. Based on our Plug and Test Technology, all cell calibrations are stored in the instrument’s firmware, and are downloaded to the cell upon selection by the user. The lower plate is heated and cooled by forced air separated from the sample area to avoid any disturbance to the material or measurement. The upper measuring system is radiantly heated by an independently controlled clamshell furnace. Shrinkage of the sample volume due to crosslinking is compensated by automatically controlling the normal force on the upper plate. For environmentally sensitive samples, the UV Cell is equipped with a preheated inert gas inlet.

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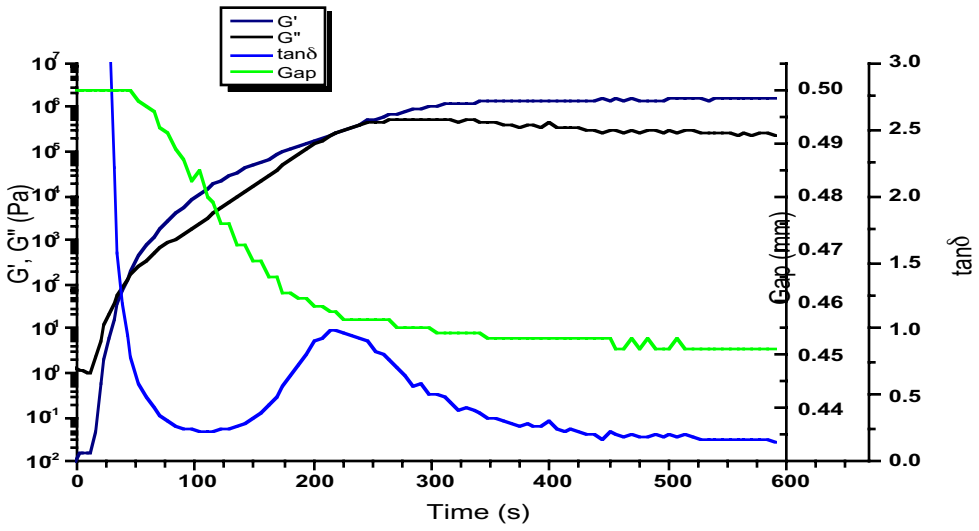
The UV Cell is suitable for any external light source to suit the sample properties and technical requirements. The relay opening and closing of the light source can be controlled through the instrument software, thus allowing automated measurements.

Application

The cure of materials typically results in shrinkage of as much as 10-15%. If the measurements are made with the gap at a constant setting, the shrinkage of the materials will result in large internal stresses during the cure after gelation. As soon as the gel point is reached (i.e., tan delta =1), the instrument changes to autotension mode and maintains the normal force at zero during the remainder of the cure cycle. The shrinkage can be monitored quantitatively using the gap measurements.

An example of an experiment run under these conditions is shown in Figure 4. A mixture consisting of 2-hydroxy ethyl methacrylate, a small amount of ethylene glycol dimethacrylate crosslinker and a photoinitiater in an inert solvent is cured photochemically between the lower quartz plate and upper 25 mm diameter plate of the rheometer equipped with the UV cell. Initially the gap is set at 0.5 mm. The moduli (G' and G") rise rapidly after the shutter is opened, while tan delta (=G"/G') drops from infinity (G'=0 in the initial liquid state). When tan delta drops below 1, the autotension mode is employed, and the reduction in the gap can be monitored during the remainder of the cure.

Without this adjustment to reduce the internal stresses, the measurement of the rheological properties in the solid state may be compromised by artifacts due to the delamination of the sample from the plate, or the formation of voids in the sample.



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