Cambridge Polymer Group

ORS 2014, New Orleans

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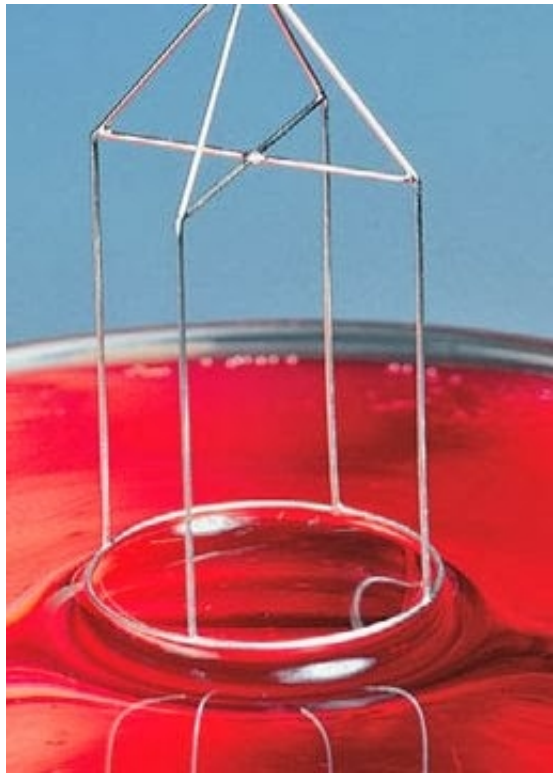
Is Your Liquid Tense?

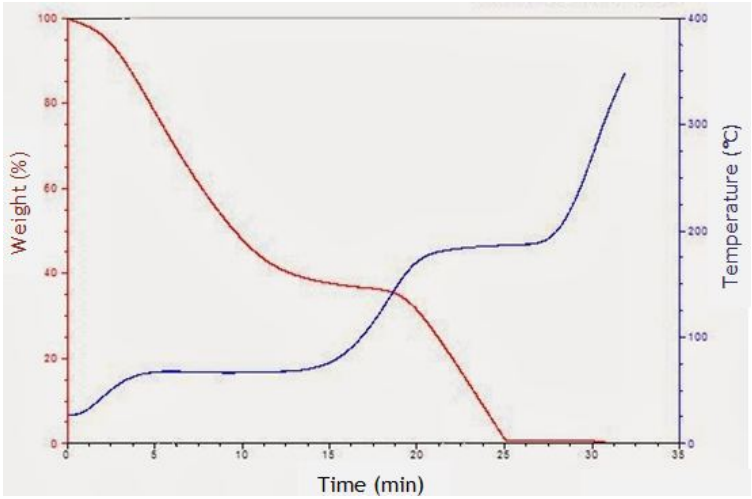
Surface tension is the property that allows water striders to glide across the surface of a pond, for razor blades to float in a glass, and for water to stream from a hose for a certain length before breaking up into droplets. It is caused by intermolecular forces holding molecules in a liquid together, resisting an externally applied force.

In water, the strong hydrogen bonds give water a high surface tension relative to other liquids (72.8 mN/m vs. ~30 mN/m) for many organic solvents); this hydrogen bonding also results in water having a higher boiling point than many organic solvents. Mercury is also known for having a high surface tension (480 mN/m), resulting in its propensities for forming balls when placed on a substrate. Surface tension and energy are sometimes used interchangably, although tension is only applied to liquids. High surface energy liquids will not wet, or spread out, onto substrate that has a lower surface energy. Surfactants reduce the surface tension of liquids, allowing them to wet substrates that would normally not be wet by the unmodified liquid. Read on here.



Thermal and Infrared Characterization of Materials

The increasing interest in material deformulation analysis and quantification of trace compounds in materials has led to the development of coupled analytical techniques. One of these techniques is TGA-FTIR, which combines the mass sensitivity of thermogravimetric analysis (TGA) with the compound identification ability of Fourier transform infrared spectroscopy (FTIR). In TGA-FTIR, the sample is placed in a conventional TGA, and the mass loss is monitored as a function of temperature. As materials evaporate or are combusted, the mass of the sample will change accordingly and is monitored quantitatively by the TGA. A gas transfer line connects the TGA to the FTIR, which reports the chemical signature of the volatile components as they leave the TGA. In this manner, the identity of the volatile species can often be determined, in addition to their concentration based on the TGA mass change.



In an example experiment, we ran a 60:40 mixture of water and glycerol in our TGA-FTIR. Water has a boiling point of 100C, whereas glycerol has a boiling point around 290C. In an experiment run in nitrogen, the mass change of the sample as a function of time is shown to the left, indicating 60% loss of water by the time the tempererature reaches 100C. The remaining glycerol starts evaporating, and is gone by the time the system reaches the boiling point of glycerol. Read on here.

Cambridge Polymer Group, Inc. is an ISO 9001:2008 certified contract research laboratory specializing in polymeric materials. We provide routine analytical testing on

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materials, custom test design, failure analysis, consultation, instrumentation, custom polymer and hydrogel formulation, and out-sourced research.

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