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Nanotubes & Polymers
Topical Meeting**

**Inorganic nanomaterials and their
composites: from fabrication to
applications**

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Dynamic mechanical analysis of organic and inorganic nanotubes – elastomer composites

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Polymer-electro-conductive nanostructured composites have gained much interest, due to their potential use as flexible large size sensors with superior mechanical and electrical properties.

We use TMA (thermo mechanical analysis) and DMA (dynamic mechanical analysis) to study the thermal expansion as well as the temperature and frequency dependence of the dynamic elastic susceptibility of various nanostructured composite materials.

In this work we present a brief description of the method, the sample geometries used, etc. In the second part we present results of recent TMA and DMA measurements of polyisoprene/multiwall carbon nanotube (PMWCNT) composites (Fig.1) and Elastomer/MoS₂ (2d) and Elastomer/Mo₆S₂I₈ (nanowire) composites. For PMWCNT composites above the glass transition temperature T_g the composites with phr values above the electric percolation threshold [red (12 phr) and blue (16 phr) curves in Fig.1] show a ca. 30% higher thermal expansion coefficient than those with phr below the percolation threshold. Below T_g this difference disappears. This strong influence of filler concentration on thermal expansivity and its relation to the glass transition is discussed.

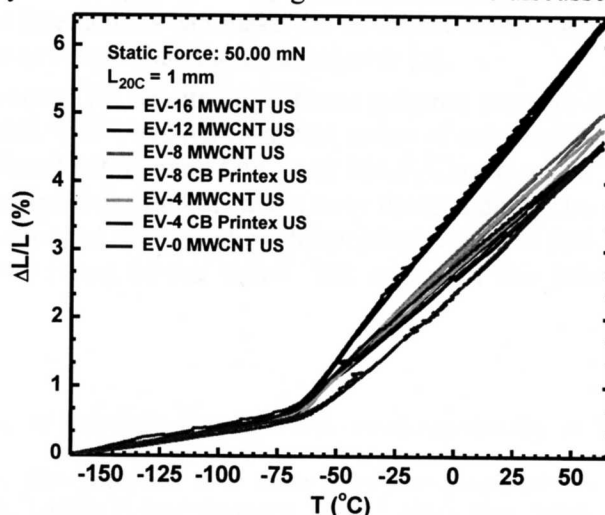


Fig. 1. Thermal expansion of polyisoprene/multiwall carbon nanotube composites with various MWCNT filler concentrations, i.e. 4 – 16 phr (parts per hundred rubber).