

ABSTRACT TITLE

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Melting gels are silica-based hybrid gels with an unusual behavior that they are rigid at room temperature, but soften around 110°C. In this study we prepared melting gels into two systems. First was prepared by mixing methyltriethoxysilane (MTES) and dimethyldiethoxysilane (DMDES) in molar percent of 75 MTES:25 DMDES and 65 MTES:35 DMDES. The second one was prepared by mixing methyltriethoxysilane (MTES) and methylphenyldiethoxysilane (MPhDES) in molar percent of 75 MTES:25 MPhDES and 65 MTES:35 MPhDES. The methyl and phenyl groups do not hydrolyze, which limits the network-forming capability. Here we study the influence of the phenyl group upon the melting gel behavior.

To gain insight into the molecular structure of the melting gels, thermogravimetric coupled with differential thermal analysis (TG-DTA), differential scanning calorimetry (DSC) and rotational rheometry studies were performed on melting gels. According to the TG-DTA the main decomposition peak of the samples into the MTES-DMDES system is placed at ~ 450°C while for the MTES-MPhDES system this decomposition is happening at ~580°C. The DSC indicated glass transition temperatures at -0.3 and at -18.8°C for the MTES-DMDES system while for the MTES-MPhDES system these were measured at -5.7 and at -23.1°C. According to oscillatory rheometry, at room temperature, the gels behave as viscous fluids, with a viscous modulus, $G''(t, \omega_0)$ that is larger than the elastic modulus, $G'(t, \omega_0)$. While decreasing of the temperature, the moduli cross over, and this temperature is recorded as the glass transition temperature T_g . The T_g values obtained from both methods are in excellent agreement