

Structural properties of supramolecular metallogel derived from vanadium and hydrazone ligand: Metallogelation triggered by hydrogen bonding, pi-pi-interactions and other non-covalent interactions

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Abstract

An approach to develop a facile strategy for the synthesis and characterization a new vanadium-metallogels was developed. In this study, vanadium was selected for the current investigation because only few vanadium-based gels have been reported in the literature. The gelation experiments were carried out successfully using vanadium acetylacetonate and hydrazone ligand in different solvents. The metallogel shows excellent gelation ability with 1.7 wt% minimum gelator concentrations and the gel-sol dissociation temperature, T_{gel} is 55 °C (water/methanol). The viscous and elastic characteristics of gel materials were also studied and the strength of the metallogel was characterized by storage (G') and loss modulus (G''). It was found that the storage modulus (G') value was significantly larger compare to loss modulus (G'') value, which confirmed the gel nature of the material. The structural properties of the metallogel were studied by using single crystal x-rays crystallography. The crystal structure data analysis of the metallogel shows the presence of various interactions such as hydrogen bonding, pi-pi-interactions, pnictogens bonding and other weak non-covalent interactions which stabilised the structure of the metallogels. The present of various intra and intermolecular interactions significantly influence the behaviour and properties of the metallogels. These intermolecular interactions play an important role for gel formation and affect the properties like swelling behaviour, viscosity and elasticity.