Abstract

The self-assembly of low-molecular-weight gelators (LMWGs) is often driven by one or more non-covalent forces, such as hydrogen-bonding (H-bonding), Van der Waals forces, dipolar interactions etc. The self-assembly leads spontaneously to formation of one-dimensional (1-D) aggregates, which either by physical cross-linking or by entanglement produce 3-D network structures that entrap and immobilize a large volume of solvent in the compartments of self-assembled fibrillar networks having a large solid-liquid interface area by surface tension and capillary forces. Thus gel formation requires a suitable gelator that can form aggregates with high aspect ratio (i.e., 1-D) at a very low concentration. Gelation behavior of amino acid-derived molecules has attracted special attention recently, as they are eco-friendly, biodegradable and can be used in biomedical applications. Present work includes the synthesis and characterization of amino acid based LMWGs and to study the effect of the non-covalent interactions, presence of chiral center, solvents, temperature and mechanical stress on their organogelation behavior. For this purpose, a series of amino acid based amphiphiles of varying chain length, headgroups, and H-bonding functionalities were designed and synthesized. It was observed that in contrast to the common consideration, amino acid based achiral amphiphiles can gelate organic solvents, and sometimes these gels are more stable than the corresponding chiral amphiphiles. The gelation capacity, thermal stability and mechanical stability were observed to increase with increase in the van der Waals interaction in the long hydrocarbon chain.

Keywords. Organogels, Amino acid, Chirality, van der Waals interaction, H-bonding.