DEPENDENCES OF THERMODYNAMIC PROPERTIES OF CARBOSILANE DENDRIMERS FROM COMPOSITION AND STRUCTURE

ZAITSEV Sergey, MARKIN Alexey, SOLOGUBOV Semen, SMIRNOVA Natalia, MUZAFAROV Aziz

Lobachevsky State University of Nizhni Novgorod, Novgorod, Russian Federation

Enikolopov Institute of Synthetic Polymer Materials of RAS, Moscow, Russian Federation

Abstract

Dendrimers are highly branched cascade polymers with regular structure which have been received by regular synthesis and related to a new class of polymer materials called «macromolecular nanoobjects». Dendrimers have been widely and successfully applied to fields of catalysis, medicinal chemistry, and nanotechnologies.

The investigation of standard thermodynamic properties of carbosilane dendrimers with different terminal groups in a wide temperature range by precision adiabatic calorimetry (AC) and DSC allows us to determine and analyze their dependences on composition and structure. The discovery of structural anomalies for carbosilane dendrimers of lower generations and high-temperature relaxation transitions (“nanosized effect”) for these of higher generations is a significant and important result of the calorimetric studies.

In this work the standard thermodynamic properties for carbosilane dendrimers of the first-ninth generations with terminal allyl and butyl groups, some representatives of carbosilanecyclesiloxane dendrimers as well as fluorine contain carbosilane dendrimers high generations were determined in the range 6–650 K by AC and DSC. So, the temperature dependences of heat capacity, temperatures and enthalpies of physical transformations were detected and the values were discussed. The effect of the composition of the dendrimers under study on their thermodynamic properties was considered. For example, the regularities of changing the thermodynamic properties of these compounds on their generation number and molecular mass were detected.

The constituent groups of the dendrimers were selected and isotherms of the dependence of the thermodynamic functions of the dendrimers upon the number of these constituents groups, described with straight lines, were chosen.

Keywords: Dendrimers, adiabatic calorimetry, DSC, heat capacity, high-temperature “nanosized effect”

Author did not supply full text of the paper.