High-pressure viscosity measurements for the ethanol plus toluene binary system

The viscosity of the ethanol + toluene binary system has been measured with a falling-body viscometer for seven compositions as well as for the pure ethanol in the temperature range from 293.15 to 353.15 K and up to 100 MPa with an experimental uncertainty of 2%. At 0.1 MPa the viscosity has been measured with a classical capillary viscometer (Ubbelohde) with an uncertainty of 1%. A total of 209 experimental measurements have been obtained for this binary system, which reveals a non-monotonic behavior of the viscosity as a function of the composition, with a minimum. The viscosity behavior of this binary system is interpreted as the result of changes in the free volume, and the breaking or weakening of hydrogen bonds. The excess activation energy for viscous flow of the mixtures is negative with a maximum absolute value of 335 J/(mol·K), indicating that this binary system is a very weakly interacting system showing a negative deviation from ideality. The viscosity of this binary system is represented by the Grunberg-Nissan and the Katti-Chaudhri mixing laws with an overall uncertainty of 12% and 8%, respectively. The viscosity of methanol (23 point) has also been measured in order to verify the calibration of the falling-body viscometer within the considered T, P range.