A New Technique for the Measurement of Viscosities of Biofuels at High Pressure

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The promotion of the biofuels as a measure to decrease the dependency on oil products as well as to decrease the CO_2 emissions, has been adopted by the European Union and it is also supportive of the agriculture sector. There is a wide range of biological origin products that can be added to the traditional fuels, but the assurance of the quality of them is an essential question and it implies the selection of reference materials that must be well characterized. Therefore, there is a need for accurate values of thermophysical properties of the new blends of fuels. Our research group has a long experience in the measurement of thermodynamic properties and now, it is involved in the setup of a new technique for the measurement of the viscosities at high pressure. The technique is a falling-body viscosimeter. The dynamic viscosity is obtained through the falling-time of a body in a vertical tube which contains the liquid for which viscosity is to be measured. The falling-time is determined using the signal detected by the coil detectors arranged along the tube which has two circuits. The primary circuit is fed with a wave generator and the induced signal of the secondary circuit is detected by an oscilloscope. The equipment can work at (0.1-140) MPa pressure range and a temperature range from -40°C to 250°C. The setup of the equipment is presented including the calibration with toluene and its validation with heptane. Rigorous uncertainty calculations were carried out and the estimated uncertainty of the dynamic viscosity was ± 2%. As a first characterization of a biofuel, the dynamic viscosity of 1-propanol is reported at a wide range of temperatures and pressures.