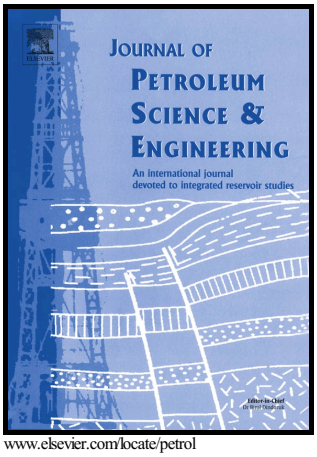

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Abstract

Rotational viscometers are widely used in the industry and in research laboratories. In order to evaluate the metrological performance of these instruments, viscosity measurements of Newtonian reference materials were carried out with a rotational viscometer of the Brookfield type and with a rheometer. Their results were compared with viscosity reference values, which were obtained in this study by measuring the same reference materials with kinematic viscosity and density working standards. Results show that the rheometer yielded more exact viscosity values than the Brookfield type rotational viscometer for low dynamic viscosities. At higher viscosities, both viscometers demonstrated to have similar metrological behaviors.

Key-words: viscosity; rotational viscometers; metrology; uncertainty of measurement; traceability

1. Introduction

Quality control of many commercial fluids requires viscosity measurements. As an example, Brazilian laws allow the addition of a certain quantity of biofuels to petroleum fuels as established in Resolution 6/2009 of the Brazil's National Council of Energetic Politics [1]. However, the mixture of biodiesel to diesel oil must be carefully controlled so as to prevent damage to the vehicle engines. To ensure that commercial biodiesel comply with such viscosity requirements, there is a Brazilian standard [2] that states that the kinematic viscosity values of biodiesel should be within 3,0 mm^2/s and 6,0 mm^2/s, at 40 °C.

Fluids Laboratory (Laflu) of Brazil's National Metrology Institute (Instituto Nacional de Metrologia, Qualidade e Tecnologia - Inmetro) belongs to the Mechanical Metrology Division (Dimec) and is responsible in Brazil for the standardization of the quantities volume, viscosity, density and surface tension. Besides the standardization of these quantities, Laflu is also responsible for the production of certified reference materials (CRM) for viscosity and those related to the quantity density, such as, anhydrous (AEAC) and hydrous (AEHC) ethylic ethanol, which are produced together with the Chemical Metrology Division of Inmetro (Dquim). When referring to viscosity, both quantities dynamic and kinematic viscosities are