CRITICAL TEMPERATURES, PRESSURES, THERMAL DIFFUSIVITIES, AND HEAT CAPACITIES OF ALKYL LACTATES

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Lactic acid esters are a significant class of organic compounds widely used in various industrial sectors. Lactates have a number of attractive properties: low vapor pressure, nontoxicity, high solvency ability, biodegradability; they are noncorrosive, noncarcinogenic, nonozone-depleting, and easily recyclable. Therefore, they are currently considered as a promising alternative to traditional solvents and plasticizers [1,2]. The development of new technological processes using lactic acid esters requires reliable thermophysical data.

This report presents the results of measuring the critical temperatures, critical pressures, thermal diffusivities, and heat capacities of methyl (CASRN 547-64-8), ethyl (CASRN 97-64-3), propyl (CASRN 616-09-1), butyl (CARN 138-22-7), and pentyl (CASRN 6382-06-5) lactates. Alkyl lactates under study decompose at near-critical temperatures; because of this, the pulse-heating method applicable to measuring the critical properties of thermally unstable compounds has been used [3]. Heat capacity in the liquid phase has been measured using a differential scanning calorimeter DSC 204 F1 Phoenix (Netzsch, Germany) at atmospheric pressure in the temperature range from 298 to 473 K. The thermal diffusivity a has been measured by the laser flash method using a LFA 457 (Netzsch, Germany). The experiments have been performed for liquid compounds at atmospheric pressure at temperatures over a wide temperature range. The relative combined expanded uncertainties with 0.95 level of confidence are: $U_r(T_c) = 0.015$, $U_r(p_c) = 0.04$, $U_r(C_p) = 0.03$ и $U_r(a) = 0.05$.

The thermal conductivity λ was calculated from the experimental data on the thermal diffusivity and heat capacity and literature data for density.

The functional self-similarity method was applied to predict the critical parameters of higher-molecular-weight alkyl lactates using the experimental data obtained [4].

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