Thermal conductivity measurements of liquids: challenges and a novel solution

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Abstract

This paper provides a concise and accessible overview of commonly used methods for measuring the thermal conductivity of liquids. Both steady-state and transient techniques are briefly outlined, including guarded hot plate methods, laser flash analysis, and approaches based on time-dependent thermal response. Particular focus is placed on the transient hot wire method, recognized for its simplicity, versatility, and its proven suitability for liquid samples. In addition, a recently developed patented approach based on the transient hot wire technique is presented in a more illustrative manner. The concept relies on improvements in sensor design and data interpretation, aimed at enhancing measurement stability and reducing typical sources of error in liquid measurements. Rather than a detailed technical validation, the emphasis is on explaining the idea and its potential benefits in practical applications.

Keywords: Transport property; experimental method; transient hot wire technique; new setup.

1. INTRODUCTION

Accurate determination of the thermal conductivity of liquids plays a crucial role in a wide range of scientific and engineering applications, including energy systems, chemical processing, and thermal management technologies. As modern industries increasingly rely on precise thermophysical property data for modelling, simulation, and optimization, the demand for reliable and efficient measurement techniques continues to grow.

Over the past decades, numerous experimental methods have been developed to measure the thermal conductivity of liquids, broadly categorized into steady-state, transient and periodic techniques. While steady-state methods are conceptually straightforward, they are often limited by long measurement times and susceptibility to parasitic heat losses. In contrast, transient methods, *e.g.* the transient hot wire technique, have gained prominence due to their rapid response, reduced influence of convection, and high precision.

This paper provides a comprehensive review of existing methods for measuring the thermal conductivity of liquids, with particular emphasis on the principles, advantages, and limitations of transient techniques. In addition, a novel experimental setup based on the transient hot wire method is presented. Patented in 2021 [1], the setup demonstrates both originality and potential for applications in research and industry [2,3].

2. OVERVIEW OF METHODS FOR MEASURING THERMAL CONDUCTIVITY OF LIQUIDS

Measurement of the thermal conductivity of liquids is more challenging than for solids due to the onset of natural convection. While a non-uniform temperature field is required to induce heat transfer, temperature-dependent density variations and molecular mobility in liquids lead to spontaneous fluid motion, which distorts the temperature field and affects measurement accuracy.

To address this, various methods have been developed and are generally classified as steady-state, transient, and periodic. In steady-state methods, convection effects can be minimized through appropriate sample geometry, enabling simpler experimental setups and reduced data requirements. Transient methods rely on short-duration measurements

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following a rapid thermal perturbation, before convection significantly develops. These methods simplify experimental design but typically require fast data acquisition and dedicated processing. Periodic methods introduce small harmonic temperature oscillations around a steady or quasi-steady state. Although they combine challenges of both steady and transient approaches, their main advantage is the use of very small sample volumes.

2. 1. Steady-state methods

The steady-state parallel-plate method [4] is based on one-dimensional heat conduction in a suitably designed measurement cell. To ensure predominantly unidirectional heat transfer, configurations with parallel plates or concentric cylinders are typically employed. In the parallel-plate setup, shown in Figure 1, a small volume of liquid is confined between two metal plates, and accurate measurement of a small temperature difference is required, usually using high-sensitivity thermocouples placed at positions where the temperatures are nearly identical.

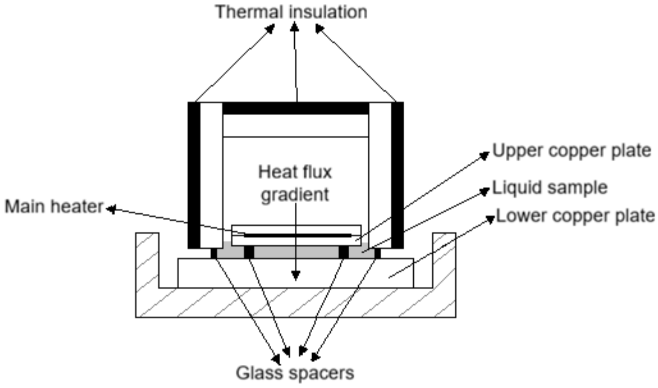

Figure 1. Apparatus for the steady-state measurement method with parallel plates

Assuming that the total heat generated by the main heater is transferred through the liquid layer, the effective thermal conductivity of the system (including separators effects) is given by Equation (1):

$$k = \frac{PL_\mathrm{g}}{S\Delta T} \tag{1}$$

where P is the heater power, ΔT the temperature difference between the plates, L_g the thickness of the liquid layer (defined by glass spacers) and S is the cross-sectional area. The thermal conductivity of the liquid is then presented by Equation (2):

$$k_\mathrm{e} = \frac{kS\text{-}k_\mathrm{g}S_\mathrm{g}}{S\text{-}S_\mathrm{g}} \tag{2}$$

where k_g and S_g denote the thermal conductivity and cross-sectional area of the spacers. To ensure measurement accuracy, heat losses must be minimized, typically by employing guard heaters that maintain isothermal conditions and eliminate radiative and parasitic heat fluxes.

The cylindrical cell method [5] is currently one of the most widely used steady-state techniques for measuring liquid thermal conductivity. In this configuration, the liquid fills the annular space between two concentric cylinders. The apparatus typically consists of a copper inner cylinder containing an electrical heater and an outer (*e.g.* galvanized) cylinder, with axial ends thermally insulated to reduce heat losses. Heat transfer occurs primarily in the radial direction through the liquid. Temperatures at the inner and outer boundaries (T_0 and T_i) are measured using calibrated thermocouples positioned near the centre of the cell, while the heat input P is determined from the voltage and current supplied to the heater. Based on the Fourier's law in cylindrical coordinates, the thermal conductivity is given by Equation (3):

$$k = \frac{\ln\left(r_2 / r_1\right)}{2\pi L\left[\dfrac{\Delta T}{P} \text{-} \dfrac{\ln\left(r_3 / r_2\right)}{2\pi L k_\mathrm{c}}\right]} \tag{3}$$

where $\Delta T = T_i - T_0$, k_c is the thermal conductivity of the inner cylinder material (copper), L is the cylinder length, and r_1, r_2 and r_3 are the corresponding radii defining the geometry of the system.

2. 2. Periodic methods

The temperature oscillation technique [6] is based on monitoring temperature changes in a liquid induced by periodic variations of temperature or heat flux. The measured thermal response reflects the effective thermal conductivity of the liquid. The experimental setup requires a measurement cell whose ends are maintained at a constant temperature by fluid circulation from a thermostatic bath, while a Peltier element provides periodic thermal excitation. Temperature is measured at multiple positions, and the signals are continuously acquired, filtered and processed using data acquisition and analysis software. The thermal diffusivity of the liquid is determined from the attenuation of the temperature oscillation amplitude from the boundary toward the centre of the sample. The thermal conductivity is then calculated from thermal diffusivity based on known density and specific heat capacity at constant pressure.

The 3ω method [7] is commonly used for liquids whose thermal conductivity strongly depends on temperature. It is based on radial heat conduction from a thin conductive element that serves simultaneously as a heater and thermometer. A sinusoidal current of angular frequency ω produces periodic Joule heating, generating temperature oscillations at frequency 2ω, while the resulting voltage response at 3ω is used for thermal conductivity determination.

For an infinitely thin line heat source on the surface of a semi-infinite medium, the temperature rise at distance r is given by Equation (4):

$$\Delta T = \frac{P}{l\pi k} K_0 qr \tag{4}$$

where k is the thermal conductivity of the medium, P/l is the power per unit length at frequency 2ω, K_0 is the modified Bessel function of the second kind (zero order), r is the radial distance between the line heat source and any point in the surrounding medium where the temperature change is being evaluated, and $1/q$ is the thermal penetration depth. The sensing element is typically fabricated by sputtering a thin metal layer onto an insulating substrate and is immersed in the liquid sample within a temperature-controlled bath (thermostat or cryostat).

The thermal comparator method [8,9] is a rapid technique based on point contact between a heated probe and the test liquid. When two materials at different temperatures are brought into contact over a very small area, a transient equilibrium temperature is established, which depends on their thermal conductivities. The contact temperature is measured using thermocouples, providing a voltage proportional to the temperature difference between the probe tip and a reference point inside the probe. Calibration curves obtained using reference liquids with known thermal conductivities allow determination of the thermal conductivity of an unknown sample.

The apparatus, shown in Figure 2, consists of a Cu probe, a heating coil, a microvoltmeter and a stabilized power supply.

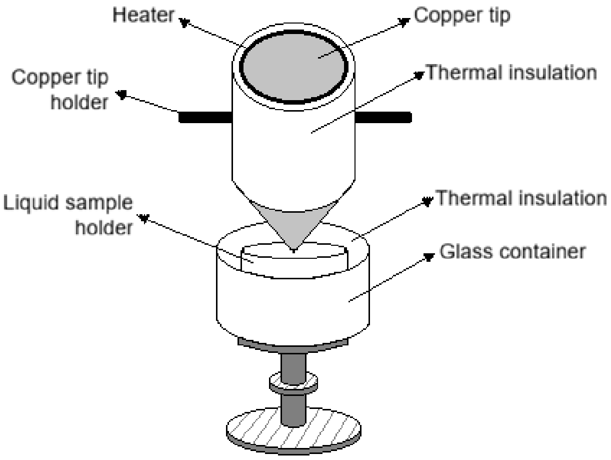

Figure 2. Apparatus for the thermal comparator method

The probe is the most critical component, as the measurement accuracy depends on heat transfer through a very small contact area. The heater maintains a controlled temperature difference between the probe and the sample, and the measurement is performed under near steady-state conditions, where the voltage signal correlates directly with thermal conductivity.

2. 3. Transient methods

Transient (impulse) methods are based on time-dependent thermal responses of a material following a short and well-defined thermal excitation. These methods are particularly advantageous for liquid thermal conductivity measurements due to their short measurement times, reduced sensitivity to convection, and high accuracy. Among them, the transient hot wire method remains the most reliable and widely used technique, while the transient plane source and laser flash methods provide valuable alternatives for specific experimental constraints.

The laser flash method, originally developed for solids, is also applicable to liquids [10]. The liquid sample is placed as a thin layer between two very thin metal disks, which act as sample holders in a sandwich configuration. A short laser pulse heats the upper disk, causing a rapid temperature increase. Heat is then conducted through the liquid layer to the lower disk, where the temperature rise is detected using a thermocouple, infrared detector, or a similar sensor. The thermal conductivity can be determined from the shape of the transient temperature response of the lower disk without the need for reference materials. Although highly accurate for solids, the method is less precise for liquids, with a typical uncertainty of about 2.6 % near room temperature. Its main advantages include (1) very small sample volume (thin layer, typically 1 to 2 mm thick), (2) relatively simple temperature control and uniform initial conditions, (3) small and easily estimated heat losses to the surrounding gas, (4) applicability as an absolute method for low-conductivity liquids without direct measurements of input energy or sample thickness, and (5) negligible radiative losses due to a small temperature rise (~2 K). Due to these characteristics, the method is particularly suitable for low-thermal-conductivity liquids such as molten salts at elevated temperatures.

The transient plane source method (TPS) is a fast and accurate technique for measuring thermal transport properties, including thermal conductivity, thermal diffusivity, and volumetric heat capacity, from a single non-destructive measurement [11,12]. The method is based on a planar heat source surrounded by the material under investigation. In practice, the sensor is fabricated as a double nickel spiral embedded between two thin layers of insulating material, commercially known as Kapton® polyimide film. The spiral functions simultaneously as a heater and temperature sensor. A concentric guard heater is often used to minimize radial heat losses. Electrical resistance of the nickel spiral serves as a temperature indicator due to its known temperature coefficient of resistance. During measurements, a current pulse is applied, causing a controlled temperature to increase in the sensor's temperature (typically from fractions of a degree to a few kelvin). The resulting changes in voltage and resistance are recorded as a function of time. A modified TPS configuration is also used for liquids, where the sample is placed on only one side of the planar sensor [13].

The transient hot wire (THW) method [14] is the most widely used and most accurate transient contact method for measuring the thermal conductivity of liquids. It is applicable to a broad range of fluids and is generally considered the reference technique. The method is based on transient radial heat conduction from a thin wire immersed in the liquid. Its implementation requires precise experimental control, high-sensitivity temperature measurement, and automated data acquisition and processing. Due to short measurement times and multiple influencing parameters, computer-controlled systems are essential. A key advantage of the THW method is the effective elimination of natural convection effects, which significantly improves accuracy compared to steady-state techniques. Modern systems achieve uncertainties around 1 %. Electrically insulated hot wires are used for conductive liquids, while bare wires are limited to non-conductive fluids. For electrically conductive or liquids at high-temperatures, modified configurations are used. In the liquid metal transient hot wire method [15], a glass capillary filled with mercury acts as an electrically isolated heating element. For highly corrosive melts (*e.g.* carbonates), maintaining large homogeneous samples is difficult. In such cases, the transient short hot wire method is applied [16], which uses smaller samples (up to ~10 cm) and is based on numerical solutions of two-dimensional heat conduction with realistic boundary conditions.

3. A NEW INSTRUMENT FOR MEASURING THE THERMAL CONDUCTIVITY OF LIQUIDS USING A NEEDLE-SHAPED SENSOR

A new instrument for measuring the thermal conductivity of liquids is based on the transient hot wire method and employs a needle-shaped sensor as the primary sensing element [1]. The system consists of a needle sensor, a liquid sample container, and a control system that governs electrical excitation and data acquisition. The liquid sample is placed in the container, preferably cylindrical with a vertical axis, to ensure symmetric radial heat propagation from the sensor. The needle sensor is immersed in the liquid and generates a transient temperature field due to controlled Joule heating. The thermal conductivity is determined from the time-dependent temperature response.

3. 1. Needle sensor

The needle sensor consists of a heating element, a temperature detection element, electrical conductors (current and voltage leads), electrical insulation, and a protective sheath. The heating element is a thin metallic wire of small cross-section that generates heat via the Joule effect when an electric current is applied. To maximize the measurement accuracy, low-resistance current leads are used so that most of the electrical power is dissipated in the heating element itself. The heating power is determined from the measured voltage and current. In a four-wire configuration, separate voltage leads are used to measure the voltage drop across the heating element more accurately, thereby minimizing the influence of lead resistance.

Electrical insulation separates all conductive components of the needle sensor and prevents electrical interference between the current paths, voltage measurement lines, and the sheath. Materials such as magnesium oxide (M_gO) powder or epoxy resin are used due to their high electrical resistivity and thermal stability. The needle sensor is enclosed in a protective sheath that provides mechanical support and thermal protection. The sheath material is selected to withstand temperatures higher than the operating temperature of the heating element; steel is a typical example. The sheath consists of two sections with different diameters. The narrow section contains the heating element, voltage lead, and electrical insulation. The fine wires are typically spot-welded at the sensor tip to ensure a stable electrical contact. The wider section accommodates the electrical connections, including current and voltage leads with appropriate insulation.

Temperature changes within the sensor are measured using either a thermocouple or a resistance thermometer. A thermocouple measures temperature variations based on the generated thermoelectric voltage, while a resistance thermometer determines temperature from changes in electrical resistance with temperature. In a simplified configuration, the heating element itself can serve as the resistance thermometer, allowing temperature to be obtained directly from its temperature-dependent resistance.

A longitudinal cross-section of the needle sensor is shown in Figure 3a. The sensor is immersed in a liquid sample (1) and connected to the control system (12) via current and voltage leads. The sensor consists of a small-diameter sheath (2) and a large-diameter sheath (11), a heating element (4), electrical insulation (5), low-resistance current leads (7, 8), and voltage leads (3, 9, 10). The heating element (4) is spot-welded at its tip (6) to the voltage lead (3) and to the small-diameter sheath (2), ensuring stable electrical and mechanical contact. The small-diameter sheath (2) contains the heating element (4), electrical insulation (5), and one voltage lead (3). The large-diameter sheath (11) accommodates the current leads (7, 8) and the remaining voltage leads (9, 10), which connect the sensor to the control system (12). The liquid sample (1) is in direct thermal contact with the external surface of the needle sensor, which includes both sheath sections and the active sensing region.

Figure 3b illustrates a representative configuration of the needle-shaped sensor and the sample container. The sensor sheath consists of two sections: a small-diameter portion (2) and a large-diameter portion (11). The needle sensor is mounted to a threaded coupling element (13), which enables secure attachment and positioning. The liquid sample container is designed as a test tube (14) and is equipped with a corresponding threaded coupling element (15) for integration with the sensor assembly. The assembled configuration of the sample container and the needle sensor is shown on the right side of Figure 3b.

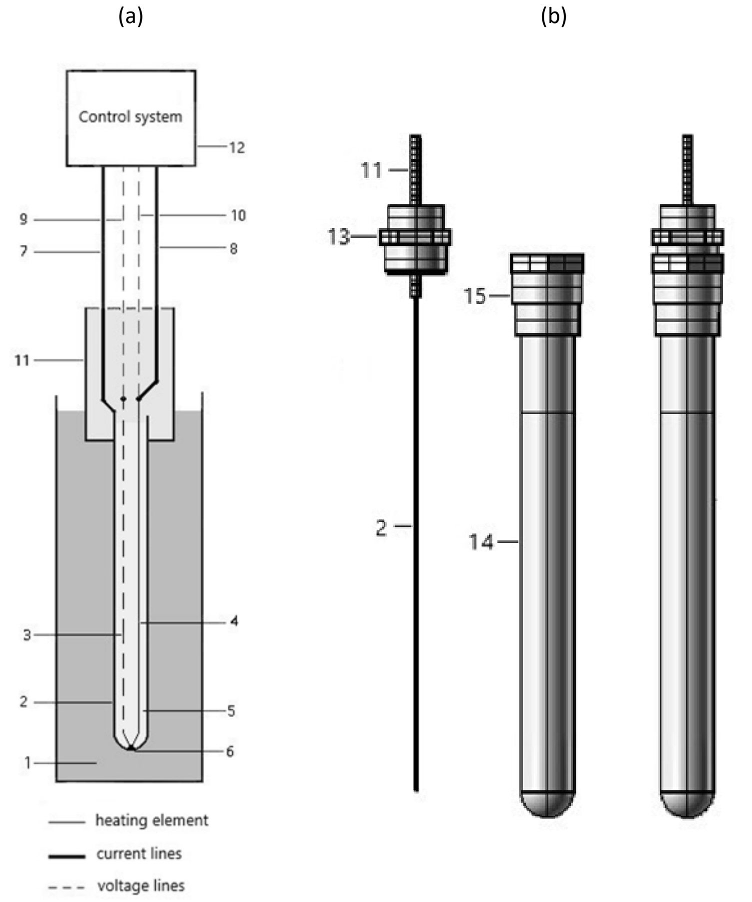

Fig3. Schematic representation of (a) needle sensor and (b) sample container with needle sensor: 1 - liquid sample, 2 - small diameter sheath, 3 - voltage line, 4 - heating element, 5 - electric insulation, 6 - welded connection, 7, 8 - current lines, 9, 10 - voltage lines, 11 - large diameter sheath, 12 - control system, 13 - threaded coupling element, 14 - sample reservoir, 15 - threaded coupling element

3. 2. Control System

The control system regulates the operation of the instrument and processes electrical signals related to current, voltage, temperature, and time. It controls the electrical excitation of the heating element, records measurement duration, and acquires sensor signals using a digital measurement system, typically based on an analog-to-digital converter (ADC). The system is implemented as a microcontroller, computer, or a combination of both, and provides real-time monitoring of current, voltage, and derived temperature values via an interactive user interface. It is programmable, enabling automated measurement control, data storage, and numerical processing.

Temperature is calculated based on the electrical characteristics of the sensing element. For thermocouples, temperature is derived from thermoelectric voltage, while for resistance thermometers it is obtained from resistance variation. When the heating element itself serves as the resistance thermometer, temperature is directly determined from its resistance change.

Figure 4 shows a schematic diagram of the control system and its connection to the needle sensor. The heating element (4) is powered by the source (19) through current leads (7, 8), with a standard resistor (16) connected in series to measure the current. One current lead (8) connects the power source to the resistor, while the other (7) is spot-welded to the small-diameter sheath (2) of the sensor.

The operation of the power source is controlled via digital control lines (21). Voltages across the heating element (4) and the standard resistor (16) are measured via voltage leads (9, 10, 17, 18) and recorded by the data acquisition system (20), which stores the data for further analysis.

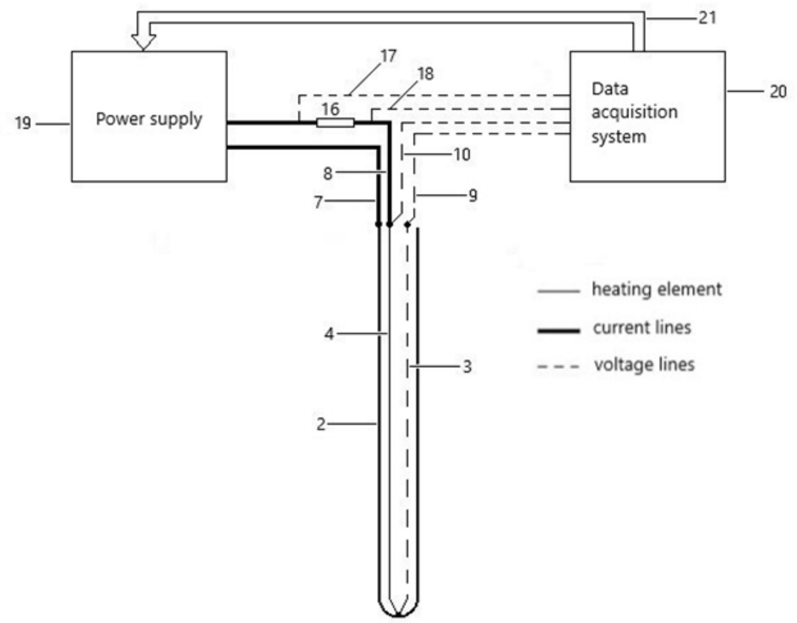

Fig4. Schematic representation of the control system: 2 - small diameter sheath, 3 - voltage line, 4 - heating element, 7, 8 - current lines, 9, 10 - voltage lines, 16 - standard resistor, 17, 18 - voltage lines, 19 - power supply, 20 - data acquisition system, 21 - digital signals

3. 3. Preferred configuration

In the preferred embodiment, the heating element is electrically connected to the control system via two pairs of conductors. The first pair consists of current leads with electrical resistance lower than that of the heating element, which supplies electric current for Joule heating. The second pair consist of voltage leads used for accurate measurements of the voltage drop across the heating element.

The electric current through the heating element is determined indirectly by measuring the voltage drop across a standard resistor connected in series with the heating element. The heating power per unit length and the electrical resistance of the heating element can be accurately calculated based on the measured current and the voltage drop across the heating element. Since the electrical resistance of the heating element changes with temperature, its resistance can be used to determine the sensor's temperature variation. The thermal conductivity of the liquid sample is calculated using the heating power and the temporal rate of temperature change of the needle sensor. In the preferred configuration, a coaxial type K (or J) thermocouple is employed, in which the Alumel (or iron) wire simultaneously functions as the heating element and as a resistance thermometer. Additionally, the instrument preferably consists of several needle sensors for the simultaneous determination of the thermal conductivity of multiple samples.

Thermal conductivity k is calculated using the transient hot-wire relation, Equation (5):

$$k = \frac{q}{4\pi \dfrac{\mathrm{d}\,\Delta T}{\mathrm{d}\ln t}} \tag{5}$$

where d ΔT/d ln t is the slope of the linear dependence of temperature rise on the logarithm of time, and q is the heat input per unit length of the heating element.

The heat input is determined from electrical measurements using Equation (6):

$$q = \frac{V_\mathrm{w} I_\mathrm{w}}{L_\mathrm{w}} = \frac{V_\mathrm{s} V_\mathrm{w}}{R_\mathrm{s} L_\mathrm{w}} \tag{6}$$

where V_w, I_w and L_w are the voltage, current, and length of the heating element, respectively, while V_s and R_s refer to the reference measurement circuit used for current determination.

This configuration was tested on several standard fluids, the results were compared with literature values, and the measurement uncertainty was evaluated [17].

4. CONCLUSION

The presented patented approach highlights the potential for further improvement of the transient hot wire technique, primarily through sensor optimization and enhanced data processing. Such improvements contribute to reducing the influence of common sources of error, such as convection and unstable measurement conditions, thereby increasing the accuracy and repeatability of the results.

Although the paper is not focused on detailed experimental analysis, it clearly indicates current development trends and the potential benefits of new solutions. In this sense, the paper serves both as a useful refresher and as an encouragement for further research and advancement in methods for measuring the thermal properties of liquids. Therefore, the displayed apparatus is undergoing further testing and improvements, especially in terms of the software and measurement reliability.

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REFERENCES

[1] Živković E, Stanimirović A, Majstorović D. Uređaj za merenje toplotne provodljivosti tečnosti primenom senzora u obliku igle, RS 61920, 2021

[2] Živković EM, Živković NV, Majstorović DM, Stanimirović AM, Kijevčanin MLj. Volumetric and transport properties of binary liquid mixtures with 1-ethyl-3-methylimidazolium ethyl sulfate as candidate solvents for regenerative flue gas desulfurization processes. *J Chem Thermodyn.* 2018; 119:135-154. https://doi.org/10.1016/j.jct.2017.12.023

[3] Stanimirović AM, Živković EM, Majstorović DM, Kijevčanin MLj. Transport properties of binary liquid mixtures - candidate solvents for optimized flue gas cleaning processes. *J Serb Chem Soc.* 2016; 81: 1427-1439. https://doi.org/10.2298/JSC160623083S

[4] Challoner AR, Powell RW. Thermal conductivity of liquids: new determinations for seven liquids and appraisal of existing values. *Proc A* 1956; 238: 90-106. https://doi.org/10.1098/rspa.1956.0205

[5] Kurt H, Kayfeci M. Prediction of thermal conductivity of ethylene glycol-water solutions by using artificial neural networks. *Appl Energy* 2009; 86: 2244-2248. https://doi.org/10.1016/j.apenergy.2008.12.020

[6] Czarnetzki W, Roetzel W. Temperature oscillation techniques for simultaneous measurement of thermal diffusivity and conductivity. *Int J Thermophys.* 1995; 16: 413-422. https://doi.org/10.1007/BF01441907

[7] Cahill DG. Thermal conductivity measurement from 30 to 750 K: the 3ω method. *Rev Sci Instrum.* 1990; 61: 802-808. https://doi.org/10.1063/1.1141498

[8] Clark WT, Powell RW. Measurement of thermal conduction by the thermal comparator. *J Sci Instrum.* 1962; 39: 545-551. https://doi.org/10.1088/0950-7671/39/11/303

[9] Powell RW. Experiments using a simple thermal comparator for measurement of thermal conductivity, surface roughness and thickness of foils or of surface deposits. *J Sci Instrum.* 1957; 34: 485-492. https://doi.org/10.1088/0950-7671/34/12/303

[10] Tada Y, Harada M, Tanigaki M, Eguchi W. Laser flash method for measuring thermal conductivity of liquids-application to low thermal conductivity liquids. *Rev Sci Instrum.* 1978; 49: 1305-1314. https://doi.org/10.1063/1.1135573

[11] Dixon C, Strong MR, Mark Zhang S. Transient Plane Source Technique for Measuring Thermal Properties of Silicone Materials Used in Electronic Assemblies. *Int J Microcircuits Electron Packag.* 2000; 23: 494-500

[12] Gustafsson SE. Transient plane source techniques for thermal conductivity and thermal diffusivity measurements of solid materials. *Rev Sci Instrum.* 1991; 62: 797-804. https://doi.org/10.1063/1.1142087

[13] C-Therm. http://www.ctherm.com/products/tci_thermal_conductivity/how_the_tci_works/ Accessed March 1, 2026.

[14] Nagasaka Y, Nagashima A. Absolute measurement of the thermal conductivity of electrically conducting liquids by the transient hot-wire method. *J Phys E Sci Instrum.* 1981; 14: 1435-1440. https://doi.org/10.1088/0022-3735/14/12/020

[15] Bleazard JG, Teja AS. Thermal conductivity of electrically conducting liquids by the transient hot-wire method. *J Chem Eng Data* 1995; 40: 732-737. https://doi.org/10.1021/je00020a003

[16] Xie H, Gu H, Fujii M, Zhang X. Short hot wire technique for measuring thermal diffusivity of various materials. *Meas Sci Technol.* 2006; 17: 208-214. https://doi.org/10.1088/0957-0233/17/1/032

[17] Stanimirović AM, Živković EM, Milošević ND, Kijevčanin MLj. Application and testing of a new simple experimental setup for thermal conductivity measurements of liquids. *Therm Sci.* 2017; 21: 1195-1202. https://doi.org/10.2298/TSCI160324219S

Merenje toplotne provodljivosti tečnosti: izazovi i novo rešenje

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(Stručni rad)

Izvod

Ovaj rad pruža sažet i pristupačan pregled najčešće korišćenih metoda za merenje toplotne provodljivosti tečnosti. Ukratko su prikazane stacionarne i nestacionarne tehnike, uključujući metode sa zaštićenom toplom pločom, laserski bljesak, kao i pristupi zasnovani na vremenski zavisnom toplotnom odzivu sistema. Poseban fokus stavljen je na metodu prelazne vruće žice, koja se izdvaja po svojoj jednostavnosti, fleksibilnosti i pogodnosti za merenja na tečnim uzorcima. Pored toga, predstavljen je na ilustrativan način i novorazvijeni patentirani pristup zasnovan na tehnici prelazne vruće žice. Koncept se zasniva na unapređenju dizajna senzora i interpretacije podataka, sa ciljem poboljšanja stabilnosti merenja i smanjenja tipičnih izvora grešaka kod merenja karakteristika tečnosti. Umesto detaljne tehničke validacije, naglasak je stavljen na objašnjenje same ideje i njenih potencijalnih prednosti u praktičnoj primeni.

Ključne reči: Transportno svojstvo; eksperimentalna metoda; tehnika prelazne vruće žice; nova konfiguracija