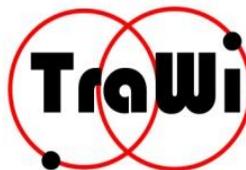




Střední průmyslová škola chemická Brno
Vranovská 65, 614 00 Brno
Tel.: 0420 545541411
Fax: 0420 545574597
E-Mail: skola@spschbr.cz
Home: www.spschbr.cz



Programm für
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Lernen

ŠPŠCH Brno

Developing vocational education concepts for the professional fields of action

"Working in the chemistry laboratory" and "operator"

Applied Chemistry and Food Analysis

ULO2: 2. Measurement of the molar refraction of the fluids for determining the quality of the raw material

Imagine that you work in the quality department of the company Synthron and there's your daily task to determine the molar refraction of liquids in the raw material. This test is very important for the proper determination of the purity and quality of the raw material.

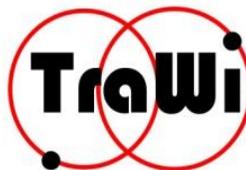
Procedural knowledge Characterization of the work activity		Factual knowledge Characterization of the working system	
Work steps	Skills / abilities	scientific contexts	technological contexts
Task: 1. Determine the molar refraction of 1-butanol, toluene, acetone, ethanol, benzene and CCl ₄ . 2. Compare the detected values with those calculated from the atomic refractions values that are shown in Tables.	<ul style="list-style-type: none">- task Analysis- Planning and organizational skills,- Self-study and preparation of the steps in the measurement	Refractometry is used in some cases to confirm the proposed structure of organic substances. From the measured refractive index calculated to the Lorentz formula of Lorenz, the so-called. Molar refraction R_M : $R_M = \frac{M}{\rho} \cdot \frac{n^2 - 1}{n^2 + 2}$, where	Determining a physicochemical constants molar refraction, to determine the purity of organic solvents based on measurements of their density and their refractive index. Namely, for determining the indicator of the quality of production of rubber.

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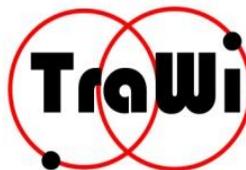
		<p>M = Molar mass of the substance in $\text{g}\cdot\text{mol}^{-1}$, ρ = density in $\text{g}\cdot\text{cm}^{-3}$, n = refractive index.</p> <p>So determined value of the molar refraction is compared with the value that is calculated as the sum of the so-called. atomic refractions and refractions of certain compounds. The atomic refraction depends not only on the nature of the atom, but also on the manner of its attachment in the molecules. The atomic and bond refractions of individual elements and connections we can find in the tables.</p> <p>.</p>	
Utilities: Abbe refractometer, wadding, Bar, pycnometer, pipette analytical balance	<ul style="list-style-type: none">- accurate and conscientious work- Handling Lab equipment- Preparation of the refractometer for measuring- Working with pycnometer- Accuracy in measuring on the analytical balance		Used for measuring the Abbe refractometer, works with pycnometer. Weighs on the analytical balance.
Chemicals: 1-butanol, toluene, acetone, ethanol, benzene, CCl_4	<ul style="list-style-type: none">- accurate and conscientious work- eco-friendly and health-		The H and P phrases knows the most commonly used chemicals. Can work with databases in which

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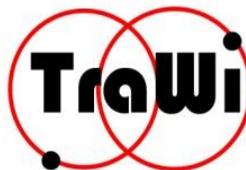
	<ul style="list-style-type: none">friendly work- be familiar with H and P phrases for the used chemicals- Working with databases		to find the information on the chemicals used are.
Procedure: <ol style="list-style-type: none">1. Prepare the refractometer for measurement.2. 3 times measure the refractive index of the above liquids.3. Determine the density of the above-mentioned liquids pycnometrically.	<ul style="list-style-type: none">- accurate and conscientious work- Handling Lab equipment- eco-friendly and health-friendly work- act according to instruction- Capture measurement values clearly		Performs measurements of the refractive index using a refractometer. Determined by pycnometry the density of liquids.
Evaluation and calculations: <ol style="list-style-type: none">1. To calculate the measured density pycnometrically use following relation $\rho = \frac{(m_2 - m) \cdot \rho_0}{m_1 - m}, \text{ where}$ <p>m = mass the pycnometer, m_1 = Mass of the pycnometer with water, m_2 = Mass of the pycnometer with liquid sample,</p>	<ul style="list-style-type: none">- use mathematical relationships for the evaluation of the measurement results- capture calculated results- use physicochemical tables		Uses mathematical formulas for calculating the pycnometrically certain density. Calculates the molar refraction of liquids using the Lorentz formula of Lorenz. Calculates the molar refraction of the atomic refractions

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<p>ρ_0 = Density of water at the laboratory temperature of the tables.</p> <ol style="list-style-type: none">Using Lorentz Lorenz's formula molar refraction of 1-butanol, toluene, acetone, ethanol, benzene and CCl₄ calculate.Calculate the molar refraction of the aforementioned liquids, as a sum of the so-called atomic refractions and refractions of certain compounds.Compare values of Mol refractions.			
<p>Conclusion:</p> <ol style="list-style-type: none">Summarize results in the table.Cite all calculations associated with the calculation of Mol refractions, the Protocol.	<ul style="list-style-type: none">- Analysis of the measured values- Assessing the correctness, accuracy and reliability of measurement results		<p>Draws the tables, in which he writes the measurement results and calculations. Assesses the adequacy, accuracy and reliability of the results.</p>
<p>Remarks</p>	<p>-</p>		

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