



Transfer von Erfahrungen bei der Gestaltung einer wirtschaftsnahen berufspraktischen Ausbildung in den Strukturen schulisch orientierter Ausbildungssysteme

Leonardo da Vinci Innovationstransferprojekt
„TraWi“

Projektnummer: DE/13/LLP-LdV/TOI/147629



Programm für
lebenslanges
Lernen

ŠPŠCH Pardubice

Professional field of action: „Chemical plant Operator“

Chemist operator

LEE 2b: 2. Estimation of pH

You are a laboratory technician in a chemical plant that produces organic specialities. You are responsible for both process and output control of the production. Your today's task is to control the process of Akardin (N, N - diphenyl - N – methylurea) production by pH measurement of its aqueous solution. To meet the technical requirements, the pH value of the substance leach should be in range from 6.5 to 7.5. To perform the measurement you are provided with pH-meter and pH-measuring cell. pH-meter has to be calibrated prior its use and the accuracy of the measurement has to be checked by a control sample, pH value of which is close to the expected value of the sample.

<p>Knowledge of procedure Characterization of working activity</p>		<p>Expertise Characterization of working systems</p>	
<p>Working steps</p>	<p>Skills/abilities</p>	<p>Context of natural science</p>	<p>Context of technology</p>
<p>Working tasks:</p> <ul style="list-style-type: none"> • Prepare sample solution. • Calibrate pH-meter. • Control accuracy of the pH 	<ul style="list-style-type: none"> • knows the importance of pH quantity for expression of solutions acidity • knows methods of pH 	<p>Parameter pH describes acidity of solutions. It is defined as: $pH = -\log[H_3O^+]$ pH depends on temperature. At</p>	<p>TECH equipment used: titration unit/pH-meter Titrimo 716</p>

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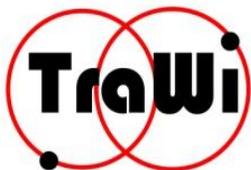


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<p>measurement.</p> <ul style="list-style-type: none"> • Measure pH of the sample solution. • Evaluate the sample. 	<p>estimation</p> <ul style="list-style-type: none"> • knows principle of pH measurement (pH-meter, pH-measuring cell) • describes buffers, purposes of their use and principle of their functioning 	<p>25°C the scale of pH covers 14 units where pH=7 means neutral solution, pH lower than 7 acidic solution and pH higher than 7 alkaline solution.</p>	<p>magnetic stirrer</p>
<p>Analysis of the assignment: Analysis of the task. Planning and organizing work. Identifying risks. Identifying workplace health&safety rules.</p>	<ul style="list-style-type: none"> • analyzing the assignment of the task • planning the partial working steps • organizing work • time-management to finalize the task in given time • researching potential risk of chemicals to be handled with • respecting workplace health&safety rules 	<p>There are a few methods of pH estimation. Measurement with pH-electrode connected to pH-meter is an objective method that provides reliable results</p>	
<p>Labware: titration unit/pH-meter, pH-electrode with an inbuilt temperature sensor, scales, magnetic stirrer, filtration unit or centrifuge, common glass ware</p>	<ul style="list-style-type: none"> • collecting lab-ware, chemicals, devices • proper use of laboratory instruments and equipment • accurate performing of 	<p>The device consists of automatic burette, titrator equipped with microprocessor, measuring cell and magnetic stirrer. In addition to this titration function the device allows to work in single</p>	<p>pH-electrode has inbuilt temperature sensor. Measured pH is automatically re-calculated to value at temperature of 25°C. pH-meter has to be calibrated prior to pH-measurement. The</p>

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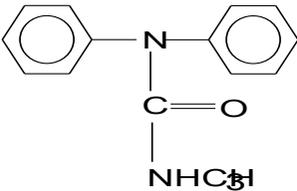
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	<p>operations</p> <ul style="list-style-type: none"> operating the device by following user manual keeping equipment clean and in a good working order saving energy, water and other consumables 	<p>pH measurement mode.</p>	<p>buffers have to be fresh, kept in fridge till the next use. The electrode must be kept in preservation solution till the next use.</p>
<p>Chemicals: buffer solution pH=4.00 buffer solution pH=7.41 buffer solution pH=9.18 control sample pH=6.87 sample of Akardit</p>	<ul style="list-style-type: none"> identifying the potential risk (emphasis on H, P sentences, safety of work and environmental protection) compliance with the occupational health and safety policy abiding by the respective safety regulations to minimize the risk 	<p>Akardit (N, N - diphenyl - N – methylurea) is a white up to greyish crystalline solid, poorly soluble in water. Its structural formula is as follows:</p> 	<p>Akardit is produced by the condensation of diphenyl carbamoyl chloride with methylamine in toluene. Subsequently, the solution is desalted and concentrated. Akardit is isolated and dried subsequently.</p>
<p>Preparation of Akardit solution: Weigh 10.0 g of dried sample, add 250 mL of reboiled distilled water, keep mixing the solution with stirring rod for 1 minute, then allow the solution to cool either in fridge or in a cold water bath. Filter the</p>	<ul style="list-style-type: none"> accurate and clean weighing compliance with good laboratory practice when preparing solutions careful filtering 		

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<p>suspension and measure pH value of the supernatant.</p>			
<p>Setting-up of the measuring unit: Switch the pH-meter ON, press button User Meth to select a method to be used.</p>	<ul style="list-style-type: none"> • following user manual to set-up device for measurement • selecting measurement options 		
<p>Calibration of pH-meter: Pour each buffer solution into a beaker, insert mixing body. By following user manual perform 3-point calibration. Put each buffer on the magnetic stirrer, immerse the electrode into the buffer solution and start calibrating. After each measurement rinse the electrode with distilled water and wipe it with cellulose wadding. Make a record about the calibration by putting down the value of electrode asymmetry and the slope of the calibration curve into the measurement protocol.</p>	<ul style="list-style-type: none"> • following step-by-step work flow procedure to calibrate device prior to pH measurement • compliance with good laboratory practice when calibrating device 		
<p>Control sample measurement: To check accuracy, carry out</p>	<ul style="list-style-type: none"> • achieving awareness of necessity to perform regular 		

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<p>measurement of a control sample, pH of which is 6.87. The found value mustn't differ from this given value by more than 0,1 pH unit. Make a record about the result of the control measurement into the protocol.</p>	<p>control of accuracy</p>		
<p>Evaluation: Make records on findings. Compare the obtained result with the required value. Interpret the result. Evaluate the measurement.</p>	<ul style="list-style-type: none"> • making records about measurements • data processing • evaluating and presenting results and findings 	<p>The found value of pH has to be in range from 6.5 to 7.5.</p>	
<p>Disposal: All solutions may be washed down the drain. Do not return unused solutions to the stock solution containers.</p>			

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