

Reaction rate and activation energy of the acid hydrolysis of ethyl acetate

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Principle

In acid solution, ethyl acetate is hydrolysed to equivalent quantities of ethanol and acetic acid according to a pseudo-first order rate law. The alkalimetric determination of the acetic acid formed enables conclusions to be drawn on the temporal concentration of ester.

Benefits

- Thermostat for precise temperature control
- Stable and safe construction due to solid stand material

Tasks

1. Determine the reaction rate constant for the acidolysis of ethyl acetate at two (or more) temperatures.
2. Calculate the activation energy of the reaction from the temperature dependence of the measured rate constants.

Learning objectives

- Reaction rate
- Reaction rate constant
- Rate law for first and second order reactions
- Reactions with pseudo order
- Arrhenius equation
- Activation energy

Scope of delivery

Magnetic stirrer with heater MR Hei-Standard	35753-93	1
Magnetic stirring bar 15 mm, cylindrical	46299-01	1
Magnetic stirring bar 30 mm, cylindrical	46299-02	1
Retort stand, h = 750 mm	37694-00	2
Supp.rod stainl.st.,50cm,M10-thr.	02022-20	1
Right angle boss-head clamp	37697-00	4
Universal clamp	37715-01	4
Burette clamp, roller mount., 2 pl.	37720-00	1
Immersion thermostat Alpha A, 230 V	08493-93	1
External circulation set for thermostat Alpha A	08493-02	1
Bath for thermostat, makrolon	08487-02	1
Immersion probe NiCr-Ni, steel, -50...400 °C	13615-03	1
Burette, lateral stopcock, Schellbach, 50 ml	MAU-24022024	1
Volumetric flask, Borosilicate, 100 ml, IGJ12/21	36552-00	1
Graduated cylinder, Borosilicate, 1000 ml	36629-00	1
Volumetric pipette, 50 ml	36577-00	2
Volumetric pipette, 50 ml	36582-00	1
Pipette dish	36589-00	1
Pipettor	36592-00	1
Erlenmeyer flask, Duran®, wide neck	36134-00	2
Erlenmeyer flask, stopper bed, 250 mlSB 29	MAU- EK17082306	2
Rubber stopper, without hole	39258-00	2
Beaker, boro, low-form	46054-00	1
Cristallizing dish, boro 3.3, d = 60 mm	46245-00	1
Funnel, glass, top dia. 50 mm	34457-00	1
Pasteur pipettes, 250 pcs	36590-00	1

Rubber caps, 10 pcs	39275-03	1
Wash bottle, plastic, 500 ml	33931-00	1
Digital stopwatch, 24 h, 1/100 s and 1 s	24025-00	1
Rubber hose	39282-00	2
Hose clip, diam. 8-16 mm, 1 pc.	40996-02	3
Hydrochloric acid, 1.0 mol/l, 1000 ml	48454-70	1
Caustic soda solution, 1.0 m, 1000 ml	48329-70	1
Ethyl acetate 250 ml	30075-25	1
Phenolphthalein, 0,5% solution in ethanol, 100 ml	31715-10	1
Water, distilled 5 l	31246-81	1
Tubing connector, ID 6-10mm	47516-01	2