

Preparation of p-toluenesulfonic acid

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Principle

This experiment examines the formation of p-toluenesulfonic acid. The sulfonation of toluene with concentrated sulfuric acid is an electrophilic aromatic substitution. This means, the sulphonation of toluene is an electrophilic substitution at the aromatic compound. The sulphonating reagents can be the free sulphur trioxide or the HSO_3^+ cation, which is present in the concentrated sulphuric acid in equilibrium. Unlike most other electrophilic substitutions, sulphonation is a reversible reaction. If water is present at higher temperatures, hydrolysis is mostly successful. In order to displace the equilibrium towards the desired product, the generated water must be bound or removed from the reaction mixture by way of azeotropic distillation.

Benefits

- Controlled and safe heating via heating mantle and power regulator
- Secure connection of the items by GL screw joint system

Tasks

- Prepare p-Toluenesulphonic acid from toluene and concentrated sulphuric acid.

Learning objectives

- electrophilic aromatic substitution
- sulphonation is a reversible reaction
- azeotropic distillation

Scope of delivery

Support base DEMO	02007-55	1
Support rod, stainless steel, different lengths	02037-00	2
Retort stand, h = 750 mm	37694-00	1
Right angle boss-head clamp	37697-00	3
Universal clamp	37715-01	3
Round bottom flask, 100ml, GL 25/12	MAU-27100001	1
Water separator GL25/12	35790-15	1
Dimroth-Condensor, GL 25/12	MAU-27223500	1
Graduated cylinder, Borosilicate, 1000 ml	36629-00	1
Beaker, Boro, high-form	46032-00	1
Beaker, Boro, high-form	46027-00	1
Buchner funnel, i.d. = 70, porcelain	32707-00	1
Round filter, different sizes	32977-02	1
Filter flask, 500ml, PN 34.5	34419-01	1
Rubber gaskets, conical, set of 8	39265-00	1
Water jet pump, plastic	02728-00	1
Porcelain dish 25ml, d 50mm	32516-00	1
Funnel, glass, top dia. 50 mm	34457-00	1
Heating mantle f. roundbottom flask, 100 ml	49541-93	1
Clamp for heating mantle	49557-01	1
Power regulator	32288-93	1
Desiccator, vacuum, diam. 150 mm	34126-00	1
Porcelain plate f. desiccator 150mm	32474-00	1
Rubber hose	39282-00	2
Rubber hose for vacuum	39286-00	1
Hose clip, diam. 8-16 mm, 1 pc.	40996-02	2
Glass rod, boro 3.3, l=300mm, d=7mm	40485-05	1

Wash bottle, plastic, 500 ml	33931-00	1
Spoon, special steel	33398-00	1
Crucible tongs, 200 mm, stainless steel	33600-00	1
Boiling beads, 200 g	36937-20	1
Silica gel, orange, granular, 500 g	30224-50	1
Silicon grease Molykote, 50 g	31863-05	1
Toluene 250 ml	30236-25	1
Sulphuric acid, 95-97%, 500 ml	30219-50	1
Sodium chloride, 500 g	30155-50	1
Water, distilled 5 l	31246-81	1