Flammability of plastics (Item No.: P7180600)

Curricular Relevance

Area of Expertise: Chemie

Education Level: Klasse 10-13

Topic: Organische Chemie

Subtopic: Polymerchemie

Experiment: Brennbarkeit von Kunststoffen

Difficulty	Preparation Time	Execution Time	Recommended Group Size
Easy	10 Minutes	10 Minutes	2 Students

Additional Requirements:

Experiment Variations:

Keywords:

material property of plastics, flammability

Task and equipment

Information for teachers

Learning objectives

- A characteristic feature of plastic materials is their flammability.
- Plastic materials can be differentiated by evaluating the degree of flammability in and out of the flame, the flame-coloration and the soot formation.

Notes on set-up and procedure

In general, all plastic samples are suitable for use.

Hazard and Precautionary statements

No use of hazardous substances in this experiment.

Remarks on the students' experiments

The experiment should be carried out under the fume cupboard due to the occurring odour nuisance. When using PVC it is compelling to perform the experiment under the fume cupboard due to the evolving hydrogen chloride vapours. Make sure that the dripping plastic material does not drop into the burner nozzle.

Notes

Depending on the foreknowledge of the students, in particular in the A-Level classes of secondary school, conclusions on the polymers can be drawn based on the decomposition products. Thus the paraffin smell from the combustion of PE or PP indicates the presence of hydrocarbons, while the ammonia smell from the combustion of PUR points to evaluation table nitrogen components. In further experiments the presence of monomers can be deduced.

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Remarks on the method

This experiment represents an essential part of the study of the physical characteristics of plastic materials, from which a classification can later be derived. The examination of self-prepared plastic samples is particularly motivating for the students (see experimental units 2 and 5). After having performed all experiments and according to the above-mentioned evaluation table, a description form can be worked out, which contains the physical properties of all examined polymers (see also experiment P7182300).

Waste disposal

- Keep plastic samples which can be re-used.
- Put plastic remains and melted pieces in the normal waste.

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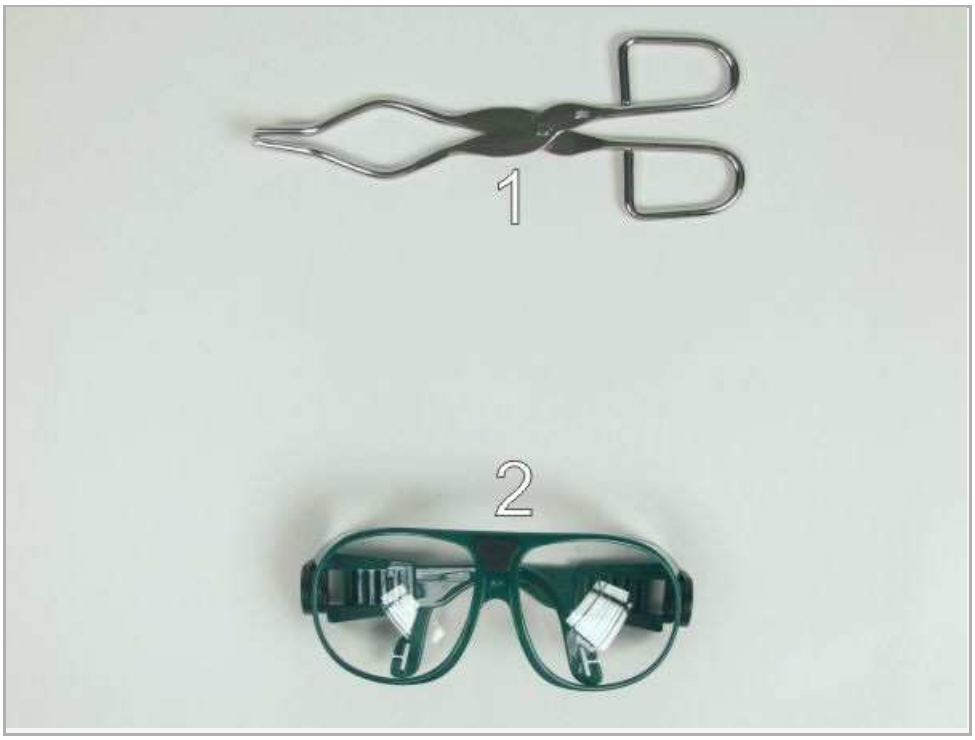
Task and equipment

Task

Which properties of plastics can be examined? (3)

Examine plastic materials for their flammability.

Equipment



Position No.	Material	Order No.	Quantity
1	Crucible tongs,200mm,stainl.steel	33600-00	2
2	Protective desk plate 40 x 40 cm	39180-10	1
	Butane catridge CV 300 Plus, 240 g	47538-01	1
	Butane burner f.cartridge 270+470	47536-00	1
	Protecting glasses, clear glass	39316-00	1
	Sample set for study of plastics, 60 pcs. of each species	31730-00	
	Lighter f.natural/liquified gases	38874-00	
	Flints, 3 pcs	38874-01	

Set-up and procedure

Set-up

Hazards

- The plastic samples can drip off burning particles while being heated. Carry out the experiment on a work-table. Wear protective glasses!
- Unpleasant-smelling gases which are harmful to health are evolved on heating! Carry out the experiment in a fume cupboard whenever possible!

Procedure

Procedure

Put the burner on the work-plate. Take a polymer piece from one of its ends by means of the crucible tongs and hold the other end in the non-luminous burner flame. Make sure that the dripping plastic material does not drop into the burner nozzle (Fig. 1).

Fig. 1

Remove the polyethylene sample from the flame, hold it for a while over the work-plate.
Proceed in the same way with other plastic samples: polypropylene, polystyrene, cellulose acetate, polyurethane, silicone rubber.

Waste disposal

Keep plastic samples which can be re-used. Put plastic remains and melted pieces in the normal waste.

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Report: Flammability of plastics

Result - Observations

Write down your observations in general form.

a) Behaviour of the plastic samples on the burner flame:

b) Behaviour of the plastic samples when removed from the burner flame:

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Result - Table 1

Write down your observations in Table 1.

Plastic sample	Flammability in the burner flame	Flammability removed from the burner flame	Flame-colouration	Further observati
Polyethylene	1	1	1	
Polypropylene	1	1	1	
Polystyrene	1	1	1	
Cellulose acetate	1	1	1	
Polyurethane	1	1	1	
Silicone rubber	1	1	1	

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Evaluation - Question 1

Draw the conclusions from your observations.

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Evaluation - Question 2

State your conclusions resulting from this experiment with regard to the applicability of plastics materials.

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Evaluation - Question 3

Which further properties of plastic materials could be determined when heated?

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