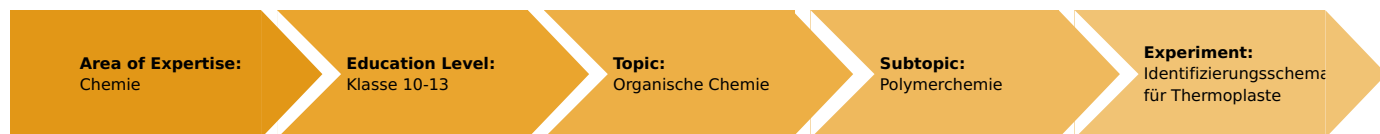


# Identification scheme for thermoplastics (Item No.: P7182300)

## Curricular Relevance



### Difficulty



Intermediate

### Preparation Time



10 Minutes

### Execution Time



20 Minutes

### Recommended Group Size



2 Students

### Additional Requirements:

### Experiment Variations:

### Keywords:

polymers, thermoplastics, material properties of thermoplastics

## Task and equipment

## Information for teachers

## Learning objectives

- Various thermoplastics differ in properties that can be detected by using simple means and methods.
- The common thermoplastics can be relatively easily identified with the help of a determining diagram based on these properties.

## Notes on set-up and procedure

For this experiment the provided plastic sticks from the TESS Chemistry Set Polymer Chemistry (see "Equipment") are very suitable, however, other thermoplastics or even self-made thermoplastics can be also used.



## Hazards

- Unpleasant-smelling gases which are harmful to health are evolved from the plastic materials when heated. Carry out the experiment under the fume cupboard.
- Wear protective glasses!

## Remarks on the students' experiments

Make sure that the flammability test does not expand too much, since the odour nuisance is relatively strong. It is recommended to carry out this experiment in groups testing different plastics.

## Notes

The information contained in evaluation Table 1 concerns the example of acrylonitrile-butadiene-styrene copolymer (ABS). The determining diagram described above is based on an identification scheme for a first simple determination of thermoplastics suggested by a South German Center of Plastics Processing (Süddeutsche Kunststoff-Zentrum, SKZ). The identification scheme can be applied to other thermoplastics, besides, a density determination and melting test can also be performed. With the latter it can be relatively easy distinguished, e.g. PE from PP, which otherwise in the determining diagram above show the same

properties.

## Remarks on the method

This experiment goes back to the experiment on properties of plastics, some knowledge thereof are of use during the realisation of the experiment. The identification of unknown plastics proves to be very motivating, especially if the students work in groups and each group examines a different thermoplastic. During the class discussion should become clear that such identifications represent only a first check, they are on no account suitable for a product control.

## Waste disposal

The plastic remains can be treated as normal waste.

# Identification scheme for thermoplastics (Item No.: P7182300)

## Task and equipment

### Task

#### How can plastic materials be differentiated using simple methods?

Examine and identify an unknown plastic.



### Equipment



Position No.	Material	Order No.	Quantity
1	Protecting glasses, clear glass	39316-00	1
2	Crucible tongs, 200mm, stainl. steel	33600-00	1
	Butane cartridge CV 300 Plus, 240 g	47538-01	1
	Butane burner f. cartridge 270+470	47536-00	1
	Sample set for study of plastics, 60 pcs. of each species	31730-00	



## Set-up and procedure

### Set-up

### Hazards

- Unpleasant-smelling gases which are harmful to health are evolved from the plastic materials when heated. Carry out the experiment under the fume cupboard.
- Wear protective glasses



### Procedure

### Procedure

Examine the appearance, hardness and fracture behaviour of the plastic rods according to Table 1 (Fig. 1). Tick the properties in the table at the corresponding box.

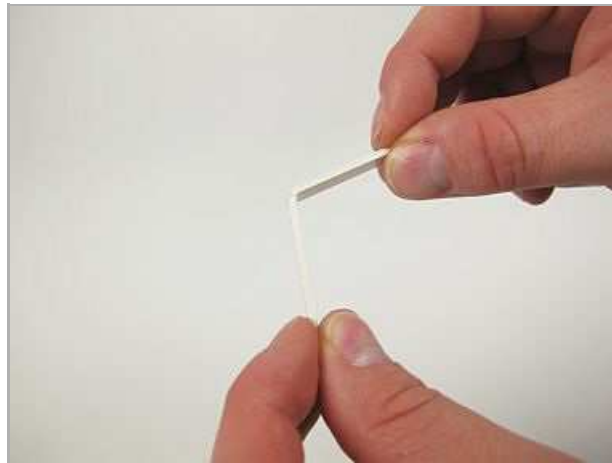


Fig. 1

Take the rod or one of its fragments using the crucible tongs, and hold it briefly in the non-luminous flame of the burner (Fig. 2). Check if the plastic still continues to burn outside of the burner flame (Fig. 3). Tick also here the properties at the corresponding box in the table.

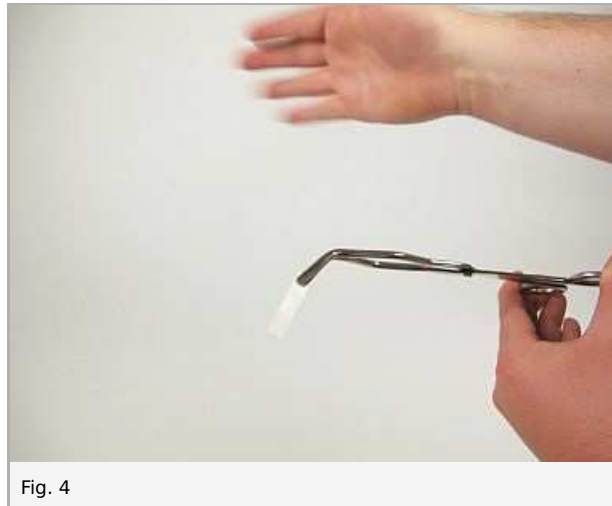


Fig. 2



Fig. 3

If necessary, extinguish the flame of the burning plastic rod and check the odour of the rising gases by fanning (Fig. 4). Take note of your odour impression in the table.



## Waste disposal

The plastic remains can be treated as normal waste.

## Report: Identification scheme for thermoplastics

### Result - Table 1

Write down your observations in Table 1.

Test method		Properties					
Visual examination	Appearance	transparent or opaque	0 ±0	crystal clear	0 ±0		
	Hardness	waxy	0 ±0	hard	1 ±0		
	Breaking test	does not break	0 ±0	clean break	1 ±0	brittle break	0 ±0
	Combustion test	does not burn	0 ±0	sooty	1 ±0	not sooty	0 ±0
	Smell test	waxy	0 ±0	like burnt horn	0 ±0	like burnt paper	0 ±0
		like styrene	0 ±0	fruity	0 ±0		

### Evaluation - Question 1

Explain to which class the plastic to be identified here belongs to.

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### Evaluation - Question 2

Could plastics belonging to other classes of plastics also be identified using this scheme?

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### Evaluation - Question 3

Try to identify the plastic by using the identification keys provided in the table below.

Test method			PE	PP	PA	ABS	PMMA	CS	CA
visual examination	Appearance	transparent oder opaque	X	X	X	X			
		crystal clear					X	X	X
	Hardness	waxy	X	X					
		hard			X	X	X	X	X
Breaking test	does not break	X	X	X					
	stress whitening				X			X	
	brittle fracture					X	X		
Flammability test	does not burn			X					
	sooty				X		X		
	non sooty	X	X			X		X	
Odour test	waxy	X	X						
	like burnt horn			X					
	like burnt paper							X	
	like styrene				X		X		
	fruity					X			

The plastic sample examined here is .....



