Ash and Moisture Analysis with prepASH 340 Series for wood, pulp, paper and paperboard

prepASH 390 Series

🔥 Burning	🌡 High Temperature	🔒 Improved Safety	⚖ Weighing Samples

Most papers consist of celluloses and inorganic fillers. A variety of fillers are used to achieve different paper quality and properties. The amount in the filler is determined by ashing the paper. Ashing is therefore an important analysis in paper production and recycling.

The organisations TAPPI* and ASTM** do have standards to determine the ash of paper*

TAPPI is the leading association for the worldwide pulp, paper, packaging, and converting industries and publisher of Paper360°. Through information exchange, trusted content, and networking opportunities, TAPPI helps members elevate their performance by providing solutions that lead to better, faster, and more cost-effective ways of doing business.
**ASTM International (ASTM), originally known as the American Society for Testing and Materials, is an international standards organisation that develops and publishes voluntary consensus technical standards for a wide range of materials, products, systems, and services.

Tappi T211: ashing at 525 °C

Tappi T413: ashing at 900° C (recommended for paper with filler)

Methods for combustion at temperatures other than that of TAPPI T 211 or T 413 are published. These may give different results, based on present loading material.

ASTM D 586: A: Ash Content Upon Ignition at 525°C

B: Ash Content Upon Ignition at 900°C.

In prepASH, determination of the moisture should be at 105 °C, ash at 525 °C and ash at 900 °C which can be done with one single weigh-in - automated calculation of losses and residues on chosen base.

Automation of the moisture and ash analysis brings efficiency, quality and security into the laboratory.

The ash content of the sample may consist of:

(1) various residues from chemicals used in its manufacturing process

(2) metallic matter from piping and machinery

(3) mineral matter in the pulp from which the paper was made

(4) filling, coating, pigmenting and/or other added materials

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(1) The combustion of cellulose to form volatile combustion products occurs at about 300°C. For papers or pulp containing no added fillers or coatings, ignition at either 525°C or 900°C will yield essentially identical results of a few tenths percent ash or less. Examples of such papers include "ashless" filter papers manufactured for chemical analysis, or dissolving grade pulps.

(2) For samples containing fillers, coatings or pigments which undergo negligible change in weight upon ignition of either 525°C or 900°C, such as the oxides of silicon or titanium, and where other fillers, coatings or pigments are known to be absent, ignition at either temperature may be taken as a semi-quantitative measure of the percentage of such material present in the sample.

(3) In most cases, the ash content of paper and paperboard will contain inorganic residues from the pulp, inorganic residues from paper making chemicals, and loading or filling materials deliberately added. In such cases, the significance of the ash level determined will vary depending upon which ashing temperature is used and the identity of the materials added.

(4) For papers containing only cellulose and calcium carbonate, ignition at 525°C will remove cellulose, and moisture, but will leave as ash the calcium carbonate essentially intact. Ignition at 900°C will convert the calcium carbonate to calcium oxide. In such cases, these methods may be used in conjunction to provide a good estimate of added calcium carbonate levels.

prepASH – optimal solution to determine ash

Reduced time and effort: prepASH is a fully automatic drying and ashing equipment, so no multiple weighing back after time consuming cooling down in the desiccator but automatic calculation of results. Working in groups of similar samples in a single run will increase efficiency and optimise time of analysis.

Improved safety and efficiency: No more dangerous analysis with the open flame. With prepASH, analysis can be done in time slots unused or hardly ever used, e.g. at night.

Increased quality: Up to 20% of each ash determination has to be re-analysed because of faulty/undefined results. prepASH is highly repeatable and reliable!

Detailed analysis reports: Due to the permanent recording of measurements during the entire process and the automatic saving of the final results, all data is retrievable at any moment.

Standard Method with Oven	Vs.	prepASH
Burning off of crucibles for constant weight before		Possibility to pre-define "burning off" crucibles
Measuring tare of crucible one by one		AUTOMATIC PROCEDURE
Sampling		Sampling
Weighing + documentation of each crucible	Dry Matter	AUTOMATIC + sample addition by operator
Samples in drying oven + START		START PROGRAM
Removing samples from oven + cool down		RESULTS (moisture)
Back weighing samples, calculation (moisture)		
Pre-ashing with rapid incinerator or hot plate		RESULTS (ash)
Samples in muffle furnace		
Removing samples + cooling down in exicator	ASH	
Calculation and documentation (ash)		
Back weighing for stable results (repeat?)		

ASH AND MOISTURE APPLICATIONS FOR PLASTIC AND COMPOSITES

prepASH 340 Series

🔥 Burning	🔒 Improved Safety	🌡️ High Temperature	⚖️ Weighing Samples

The ash test of plastic samples is used to determine inorganic content. Inorganics have a major influence on the mechanical specification and behaviour of plastics to plastics. The analysis is therefore crucial for quality characteristics. Additional natural products can be added in the production so the nature and quantity are specified and have to be verified as part of Quality Control. On the other hand, components in recycled materials might be unknown and therefore have to be determined additionally. If the moisture content is too high then this is harmful in the processing of plastic granules. Automation of moisture and ash analysis with the prepASH provides efficiency, quality and security into the laboratory.

Plastic is the common term for a wide range of synthetic or semi synthetic organic amorphous solid materials suitable for the manufacture of industrial products. Plastics are typically polymers of high molecular weight, and may contain other substances to improve performance and/or reduce costs. Polymers are often blended with inorganic fillers, mainly to enhance the mechanical properties of the plastic (e.g. fibreglass) or dyeing (white colour: Titanoecid). Plastics can contain small organic molecules (polymer plasticiser, internal lubricants) and Carbon (carbon fibre). An ash test is used to determine the total thermal stable filler content. It cannot identify individual percentages in multi-filled materials without additional test procedures being performed.

ASH AND MOISTURE APPLICATIONS FOR PLASTIC AND COMPOSITES

prepASH 340 Series

Case Study: Fibreglass

Fibreglass is used as a reinforcing agent for many polymer products. The resulting composite material, correctly known as fibre-reinforced polymer (FRP) or glass-reinforced plastic (GRP), is called "fibreglass" in popular usage. As with many other composite materials, the two materials act together, each overcoming the deficiencies of the other. Whereas plastic resins are strong in compressive loading and relatively weak in tensile strength, the glass fibres are very strong in tension but have no strength against compression. By combining the two materials, GRP becomes a material that resists both compressive and tensile forces well. The two materials may be used uniformly or the glass may be specifically placed in those portions of the structure that will experience tensile loads.

The fibreglass content of the plastic can easily be determined by ashing. The polymer is burned or decomposed at high temperatures whereas the glass resists heat and is measured as the residual ash.

GF20: 20 % fibreglass, GF30: 30% fibreglass

Applications available from Precisa:

- prepASH 008 PP GF Recyclable Materials
- prepASH 3006 PVC
- prepASH 0708 Polyamide 6 filled with talcum powder
- prepASH 0709 Polypropylene filled with talcum powder
- prepASH 0710 Polypropylene filled with glass fibre
- prepASH 0711 Polypropylene filled with calcium carbonate
- prepASH 6001 Rubber compound

prepASH – optimal solution to determine ash in plastics

Reduced time and effort: prepASH is a fully automatic drying and ashing machine. This removes the requirement for multiple weighings, removal of hot material and reduces the time spent as there is no requirement for cooling post analysis in a desiccator. Working in groups of similar samples in a single run increases efficiency and optimises analysis time.

Improved safety and efficiency: No more exposure to extremely hot areas and or open flames. With the prepASH analysis can be performed automatedly in time slots where the laboratory is empty or occasionally used such as night time runs.

Improve the quality of your results by up to 20%: In the case where ash determination has to be re-analysed because of faulty/undefined results, the automated nature of the prepASH reduces the need for rework of samples.

Detailed analysis reports: Due to the permanent recording of measurements during the entire process and the automatic saving of the final results, all data can be retrieved at any time.

Standard Method with oven	vs.	
Burning off of crucibles for constant weight before		Possibility to pre-define "burning off" crucibles
Tare of crucible one by one		AUTOMATIC PROCEDURE
Addition of sample	Dry Matter	Sampling
Weighing + documentation of each crucible		AUTOMATIC + sample addition by operator
Samples in drying oven + START		START PROGRAM
Removing samples from oven + cool down		Results (moisture)
Back weighing samples, calculation (moisture)		
Pre-ashing with rapid incinerator or hot plate		Results (ash)
Samples in muffle furnace for Ash content	Ash	
Removing samples + cooling down in desiccator		
Calculation and documentation (ash)		
Back weighing for stable results (repeat?)		

Precisa

■ The Balance of Quality ■

VICTORY SCIENTIFIC

Precisa-Application Laboratory

ENr 0710_071121

prepASH 129: Ash in polypropylene samples (polypropylene filled with glass fibre, GF30)

Fully automatic drying and ashing with multiple samples.
All fundamental data and operating parameters, such as changes in sample weight, temperature, gases, etc. are stored and graphically displayed. Automatic calculation of results.

Temperature curve

Weight curve for each sample
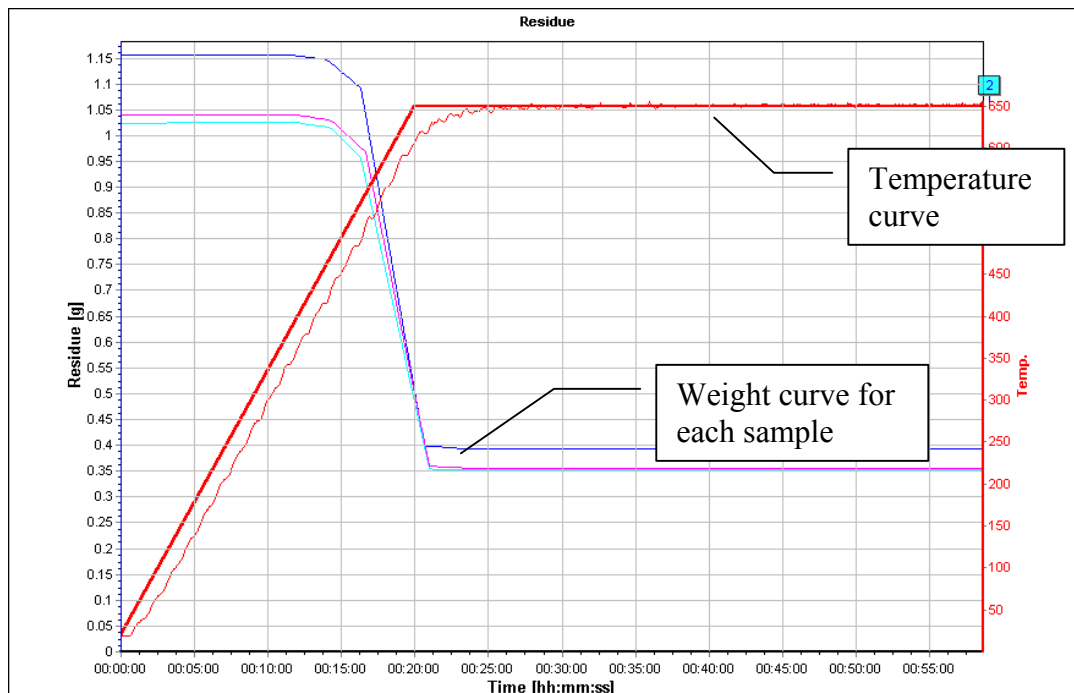
Method

Step	time	temperature 1	temperature 2	Auto Stop	gas
1	20 min	25 °C	650 °C		-
2*	2 h (40 min)	650 °C	650 °C	5 mg/30 min	-

.* Autostop after 40 min

Result

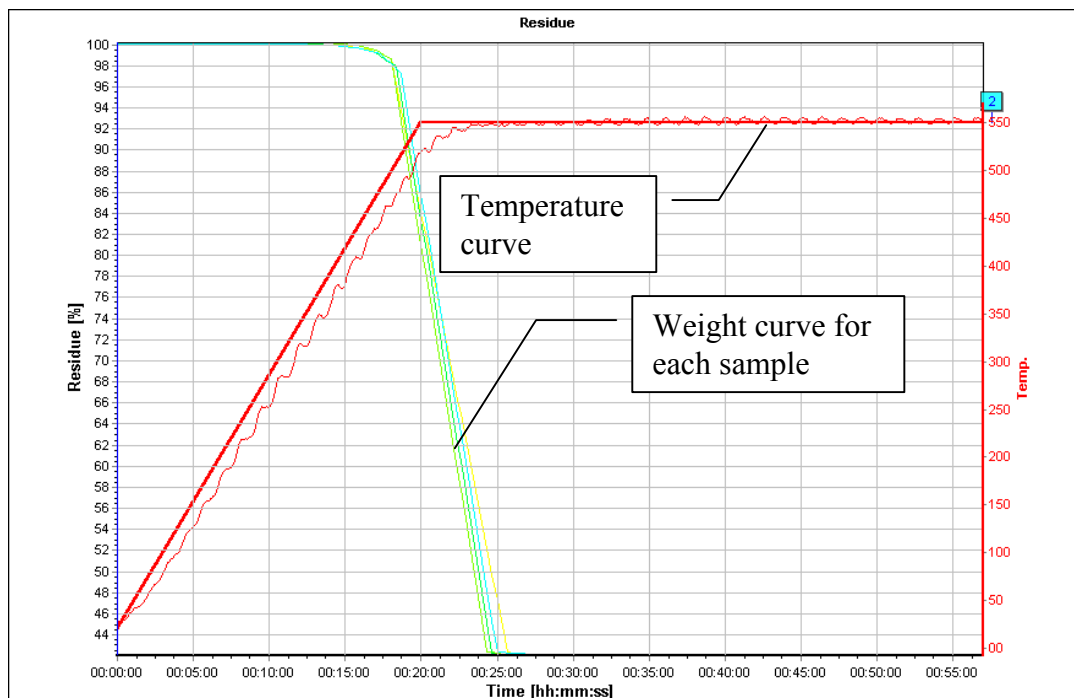| No.	Sample Name	Weight	Residue [%] after 40 min
1	Sample 1	1.1556	34.16
2	Sample 1	1.0240	34.45
3	Sample 1	1.0383	34.33
	mean		34.31
	std. dev.		0.14
	reference		34.0

Precisa-Application Laboratory

ENr 0711_071109

prepASH 129: Ash in polypropylene samples (polypropylene filled with calcium carbonate)

Fully automatic drying and ashing with multiple samples.

All fundamental data and operating parameters, such as changes in sample weight, temperature, gases, etc. are stored and graphically displayed. Automatic calculation of results.

Method

Step	time	temperature 1	temperature 2	Auto Stop	gas
1	20 min	25 °C	550 °C		
2*	3 h (38 min)	550 °C	550 °C	5 mg/30 min	

* Autostop after 38 min

Result

No.	Sample Name	Weight	Residue [%]
1	Sample 1	1.6648	42.14
2	Sample 1	1.5530	42.07
3	Sample 1	1.5373	42.04
4	Sample 1	1.7658	42.15
	mean		**42.10**
	std.dev.		**0.05**
	reference		42.2

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prepASH 129: LOI in cement samples

Fully automatic drying and ashing with multiple samples.
All fundamental data and operating parameters, such as changes in sample weight, temperature, gases, etc. are stored and graphically displayed. Automatic calculation of results.
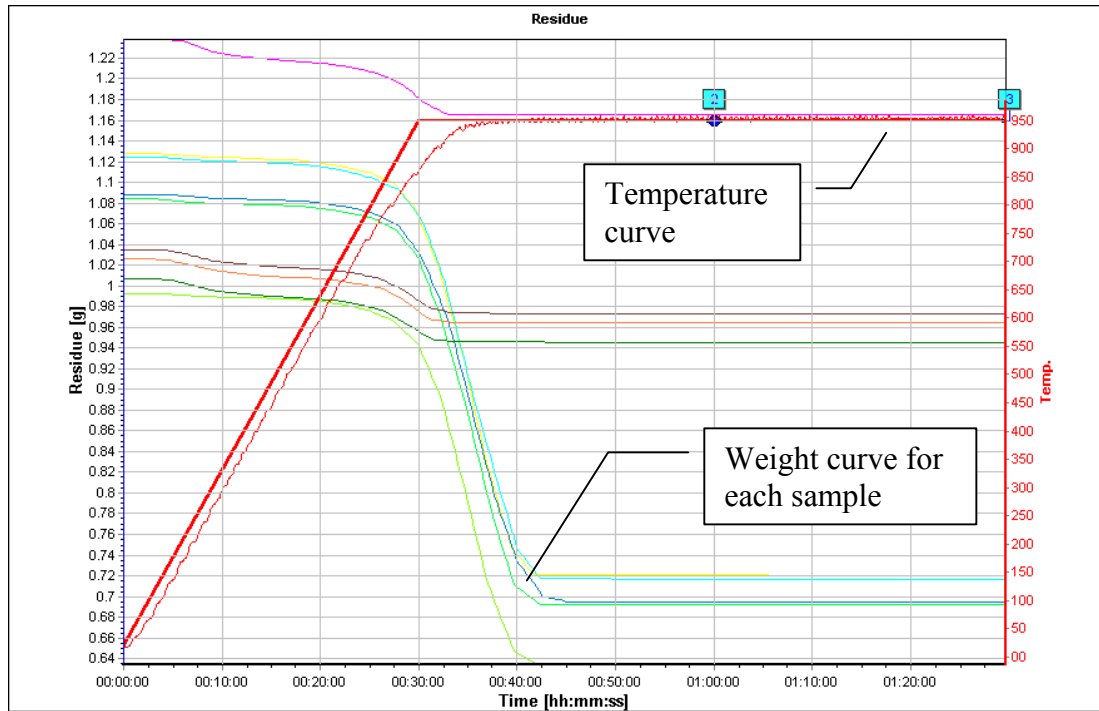
Method

Step	time	temperature 1	temperature 2	Auto Stop	gas
1	30 min	25 °C	950 °C		
2	30 min	950 °C	950 °C		
3*	30 min	950 °C	950 °C		

* Sample weight is stable after 30 min at 950 °C, step 3 is not needed.

Result

Sample Name	Weight	LOI after 30 min	LOI after 1h
raw mix1	1.1277	36.11	36.12
raw mix2	0.9922	36.12	36.12
raw mix3	1.0830	36.11	36.11
raw mix4	1.1236	36.18	36.19
raw mix5	1.0874	36.14	36.17
mean		**36.13**	**36.14**
stdev		**0.03**	**0.03**

Sample Name	Weight	LOI after 30 min	LOI after 1h
cement 1	1.2370	5.84	5.84
cement 2	1.0335	5.82	5.82
cement 3	1.0243	5.83	5.83
cement 4	1.0050	5.84	5.85
cement 5	1.1247	5.81	5.81
mean		**5.83**	**5.83**
stdev		**0.01**	**0.01**