Nederlandse Organisatie voor
toegepast-natuurwetenschappelijk
onderzoek / Netherlands Organisation
for Applied Scientific Research

TNO Quality Services BV

Return address: P.O. box 6235, 5600 HE Eindhoven, The Netherlands

Flame Guard B.V.
Attn. Mr F. Vogelzangs
P.O. Box 6572
6503 GB NIJMEGEN

De Rondom 1
P.O. Box 6235
5600 HE Eindhoven
The Netherlands

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Subject
Analyse of Aerosol compound Flame Guard

E-mail
Nicole.weekers@quality.tno.nl

Direct dialling
+31 40 265 09 15

Direct fax
+31 40 265 03 02

Project number
E07.0245

Chamber of Commerce Veluwe and Twente
081563361

INTRODUCTION

By order of Flame Guard B.V., TNO Industrial and Technology determined the presence of risky substances, like chloride, in the by Flame Guard and DSPA.nl on the market placed aerosol extinguishing agent.

TNO received the following sample to investigate:

Description	TNO sample code
DSPA Compound	06.0679

BACKGROUND AND QUESTION

On the market a few aerosol extinguishing agent of the competitor suppliers are activated spontaneously. Take into account that after activating for instance salts and traces of chloride get off.
From salts is known that these have a hygroscopic effect and of chloride is known that they have a corrosive effect on for instance the metal parts of electronic components.

Flame Guard asked TNO to demonstrate that the used DSPA aerosol as used in the DSPA generator of Flame Guard does not contain risky substances as chloride.

INVESTIGATION

TNO investigated the presence of chloride (and salt) in the aerosol compound in the DSPA generator before and after releasing (activating).
In February 2007, Flame Guard has activated, in presence of TNO, a DPSA-5.
TNO sampled and analysed the pure extinguishing agent as well as the combustion rests.

Sampling technique
A tape was used to sample "scan" the surface while the dust sticked on the tape.
Using light microscopy (LM), a representative sample was isolated on the tape, which was then analysed with Scanning Electron Microscopy and X-ray Micro Analysis (SEM-XRMA). It must be observed here that the side of the sample that is isolated with tape is the side that is not analysed. Analysed is the side that was in contact with the underling surface.
The samples are analysed visually (LM) as well as with SEM-XRMA.

Analyses
Visual (LM)
The samples are visually inspected as well as with the help of a light microscope and the observations are briefly summarised in the appendices.

SEM-XRMA
Scanning Electron Microscopy together with X-ray Micro Analysis.
By using SEM-XRMA it is possible to show a picture of the surface of affixed material while simultaneously conducting an element analysis. The material can be shown in a number of ways. With the help of the secondary electrons the outermost surface of a solid material can be imaged and photographed. The image received is called a secondary electron image (SEI). With the help of the backscattered electrons information can be obtained about the (average) chemical composition of the material being investigated, based on the average atomic number. By this means, parts with a relatively low atomic number (e.g. carbon) are darker in the picture than parts with a relatively high average atomic number (e.g. iron particles). The image received is called a backscattered electron image (BEI). Furthermore, element analyses can be carried out using SEM-XRMA. By bombarding the surface of the sample with electrons, x-rays are released as well as secondary electrons. Each element has its own specific wavelength or energy that can be measured with an x-ray detector.
In this investigation the SEI method was applied.

Selective Ion Chromatography
By rinsing a known surface of the sample with ultra pure water and than scanning and possibly diluting the solution with Selective Ion Chromatography, the presence as well as the quantity of a chloride ion can be determined (salt is sodium chloride).

RESULTS
Sample 06.0679/100 – tape sample of DSPA material after activating
The results show that the activated DSPA material contains carbon (C) and oxygen (O) a lot of potassium (K).
The pollution chloride (Cl) and/or sodium (Na) is not detected.
Photos and element spectra are given in Annex 1.

Sample 06.0679/101 – tape sample of DSPA material after activating
The results show that the activated DSPA material contains carbon (C) and oxygen (O) a lot of potassium (K).
The pollution chloride (Cl) and/or sodium (Na) is not detected.
Photos and element spectra are given in Annex 2.

Sample 06.0679/102 – tape sample of DSPA material after activating
The results show that the activated DSPA material contains carbon (C) and oxygen (O) a lot of potassium (K).
The pollution chloride (Cl) and/or sodium (Na) is not detected.
Photos and element spectra are given in Annex 3.

Sample 06.0679/103 – tape sample of DSPA material after activating
The results show that the activated DSPA material contains carbon (C) and oxygen (O) a lot of potassium (K).
The pollution chloride (Cl) and/or sodium (Na) is not detected.
Photos and element spectra are given in Annex 4.

Sample 06.0679/104 – tape sample of DSPA material after activating
The results show that the activated DSPA material contains carbon (C) and oxygen (O) a lot of potassium (K).
The pollution chloride (Cl) and/or sodium (Na) is not detected.
Photos and element spectra are given in Annex 5.

Sample 06.0679/105 – tape sample of DSPA compound before activating
The results show that the pure DSPA material contains carbon (C) and oxygen (O) and a lot of nitrogen (N) and potassium (K).
The pollution chloride (Cl) and/or sodium (Na) is not detected.
Photos and element spectra are given in Annex 6.

Sample 06.0679/106 – tape sample out of generator after activating
The results show that the sample out of the activated generator contains carbon (C) oxygen (O) and a lot of potassium (K).
The pollution chloride (Cl) and/or sodium (Na) is not detected.
Photos and element spectra are given in Annex 7.

CONCLUSION
Based on the above described investigation can overall be concluded that the investigated aerosol of Flame Guard / DSPA.nl (type DPSA-5) does not contain sodium and/or chloride.

Eindhoven, May 2007

N.P.M Weekers-Jacobs B.Sc.
Author

TNO Quality Services BV

J.J.A. Maat B.Sc.
Authorisation

ANNEX 1
Sample 06.0679/100 – tape sample

Figure 1; LM-photo

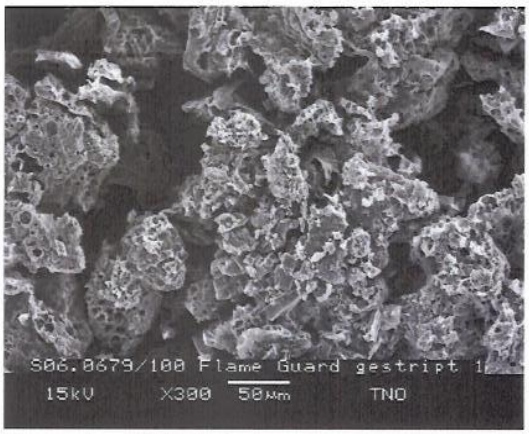

Figure 2; SEM-photo

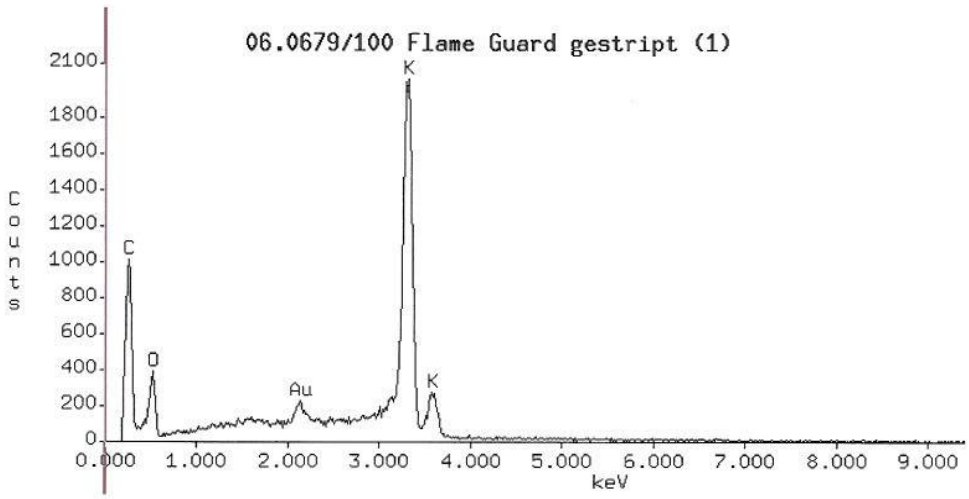

Figure 3; Element spectrum

06.0679/100

PROZA Correction Acc.Volt.= 15 kV Take-off Angle= 45 deg
Number of Iterations = 6

Element	Element Wt %	Wt % Err. (1-Sigma)	Atom %
C -K	24.41	+/- 0.28	40.20
O -K	29.48	+/- 0.64	36.44
Na-K	0.08	+/- 0.07	0.07
Cl-K	0.00	+/- 0.00	0.00
K -K	46.03	+/- 0.35	23.29
Total	100.00		100.00

Figure 4; Estimated percentages

ANNEX 2
Tape sample

Figure 5; LM-photo

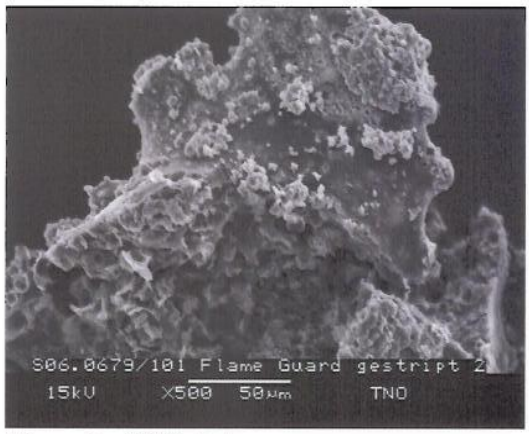

Figure 6; SEM-photo

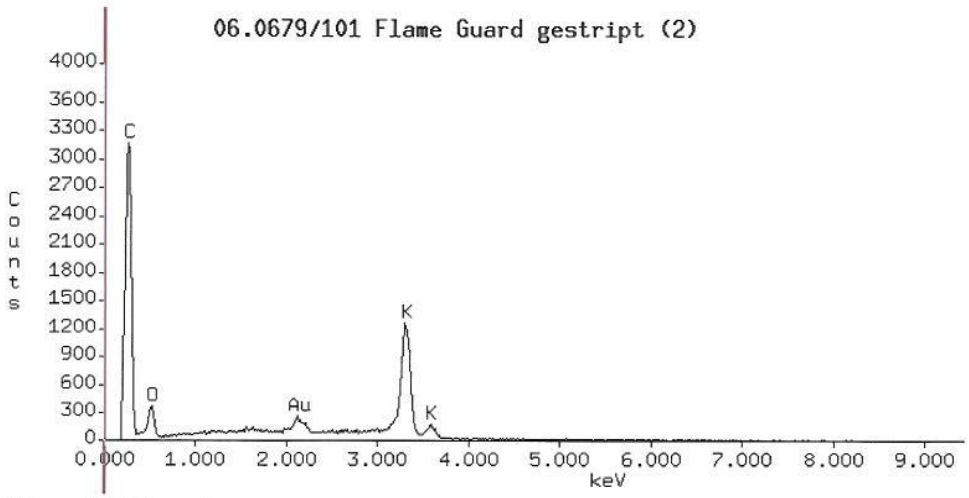

Figure 7; Element spectrum

ANNEX 3
Tape sample

Figure 8; LM-photo

Figure 9; SEM-photo

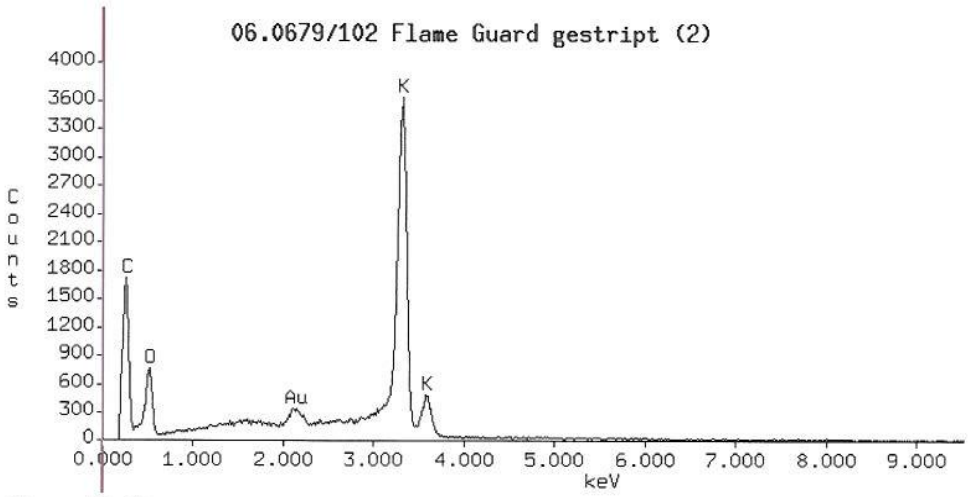

Figure 10; Element spectrum

ANNEX 4
Tape sample

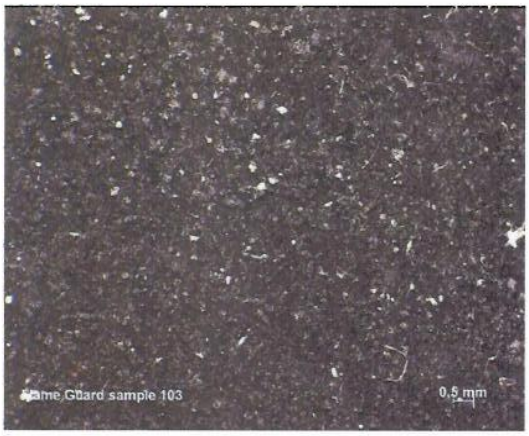

Figure 11; LM-photo

Figure 12; SEM-photo

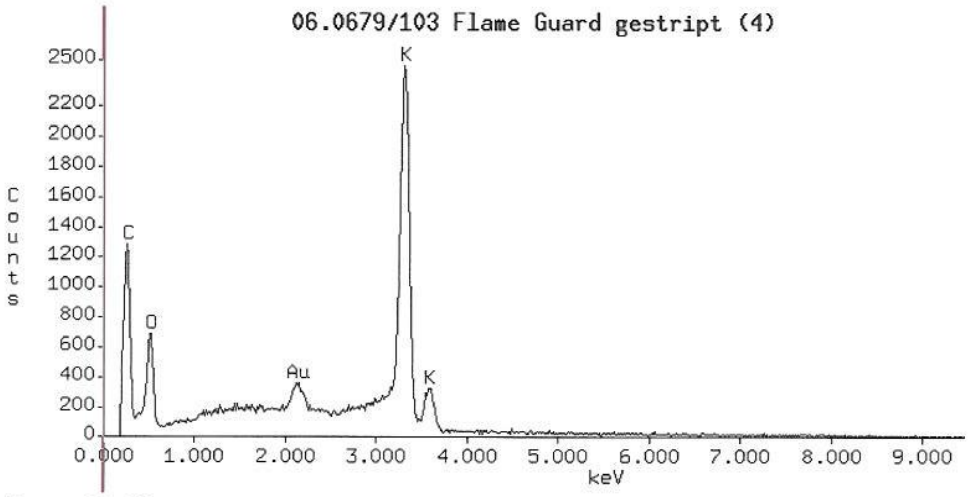

Figure 13; Element spectrum

ANNEX 5
Tape sample 3

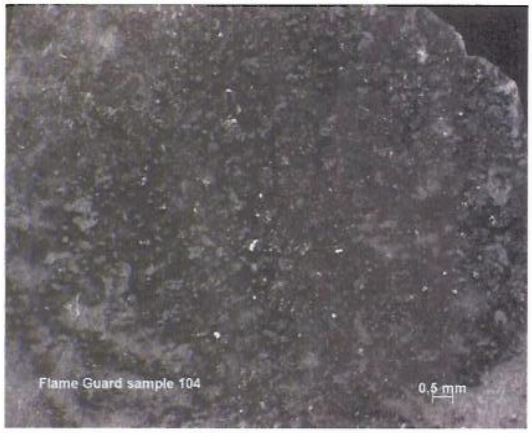

Figure 14; LM-photo

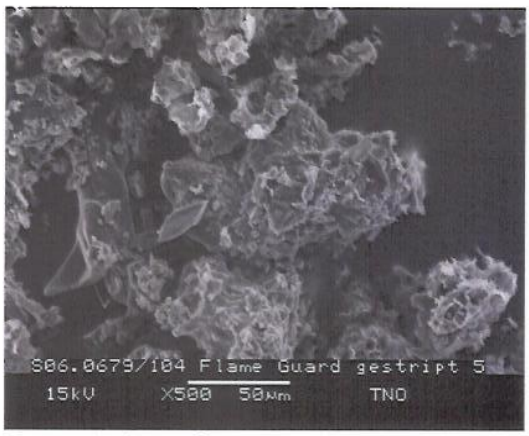

Figure 15; SEM-photo

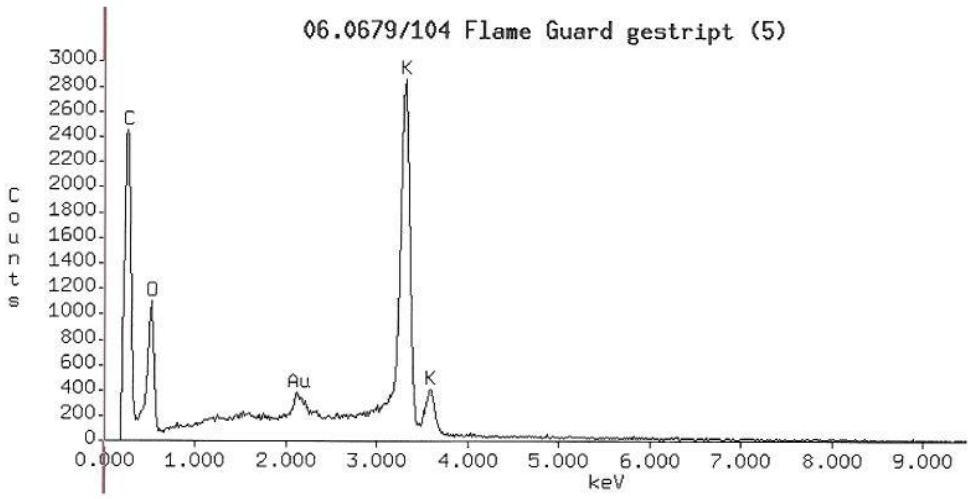

Figure 16; Element spectrum

ANNEX 6
Tape sample DSPA aerosol compound

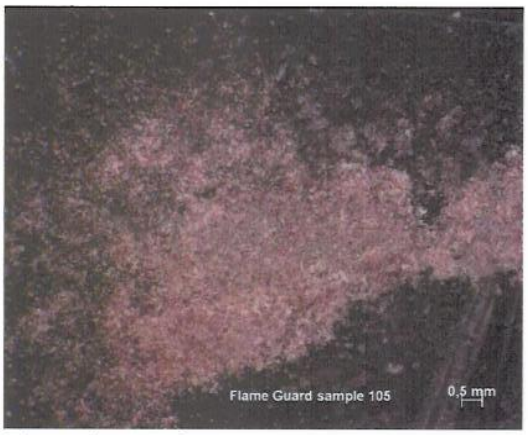

Figure 17; LM-photo

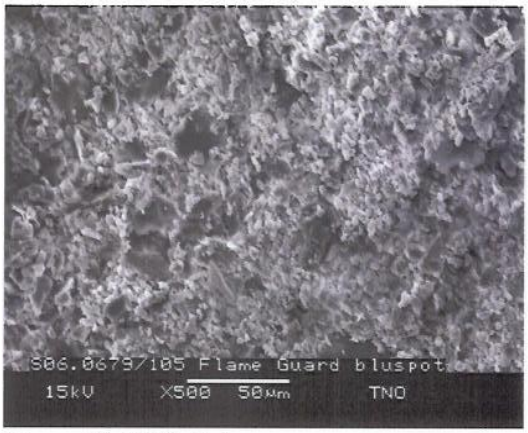

Figure 18; SEM-photo

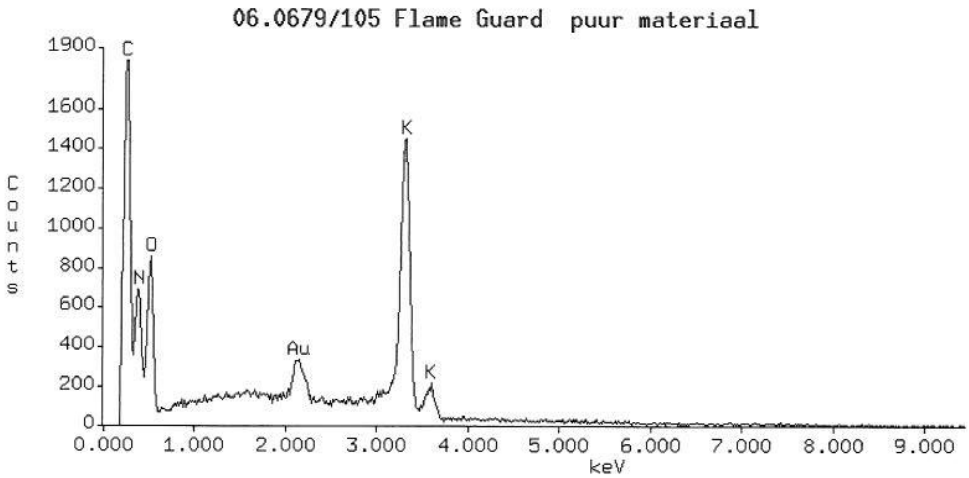

Figure 19; Element spectrum

06.0679/105

PROZA Correction Acc.Volt.= 15 kV Take-off Angle= 45 deg
Number of Iterations = 8

Element	Element Wt %	Wt % Err. (1-Sigma)	Atom %
C -K	19.61	+/- 0.22	25.38
O -K	29.93	+/- 0.62	29.08
Na-K	0.00	+/- 0.00	0.00
Cl-K	0.00	+/- 0.00	0.00
K -K	14.62	+/- 0.13	5.81
N -K	35.76	+/- 1.82	39.69
Total	100.00		100.00

Figure 20; Estimated percentages

ANNEX 7
Tape sample of the inner side of the generator

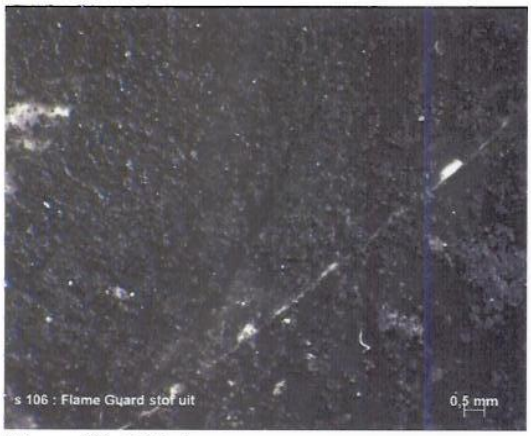

Figure 21; LM-photo

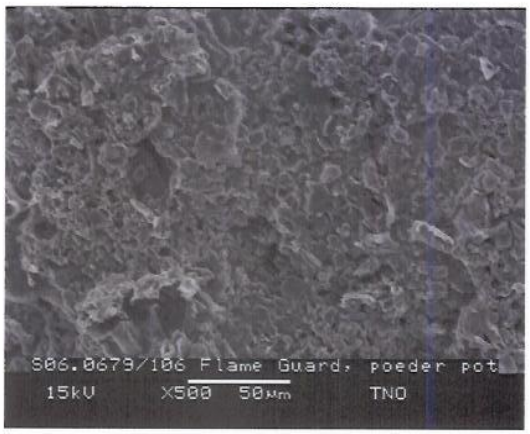

Figure 22; SEM-photo

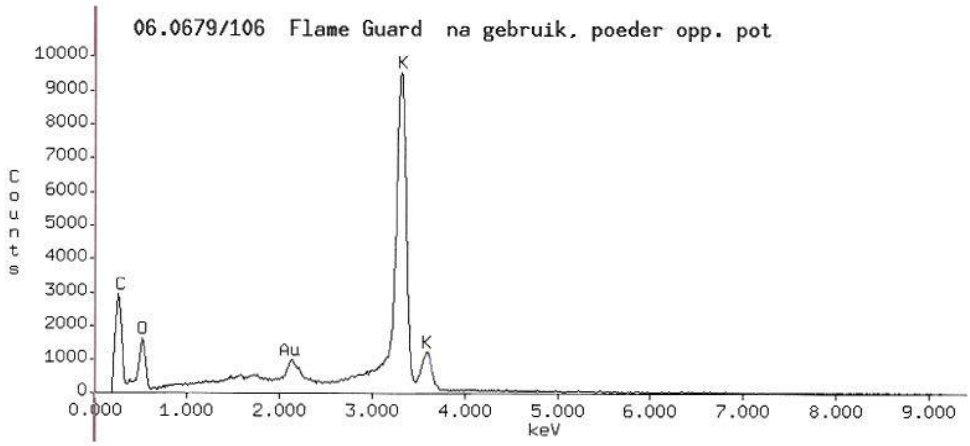

Figure 23; Element spectrum