

OBJECTS OF ANALYSIS:

GENERAL INFORMATION

- Two mummies originating from Egypt: **Big Boy** and **Small Boy**

	Big Boy	Small Boy
height	127 cm	80 cm
age	aprox. 12 years	2-4 years
AMS dating	4.-2. century BC	3.-1. century BC

- Currently exhibited at the University of Tartu Art Museum (Estonia).
- Brought to Tartu by Otto Friedrich von Richter at the beginning of 19th century.



Big Boy

Small Boy

Embalming material

Textile

Samples from the abdominal cavity

Embalming material (skin?)

Textile impregnating material

Embalming material

Sample from the hair

Photos: Signe Vahur

ANALYSIS OF MATERIALS USED FOR THE EMBALMING OF THE MUMMIES:

In total

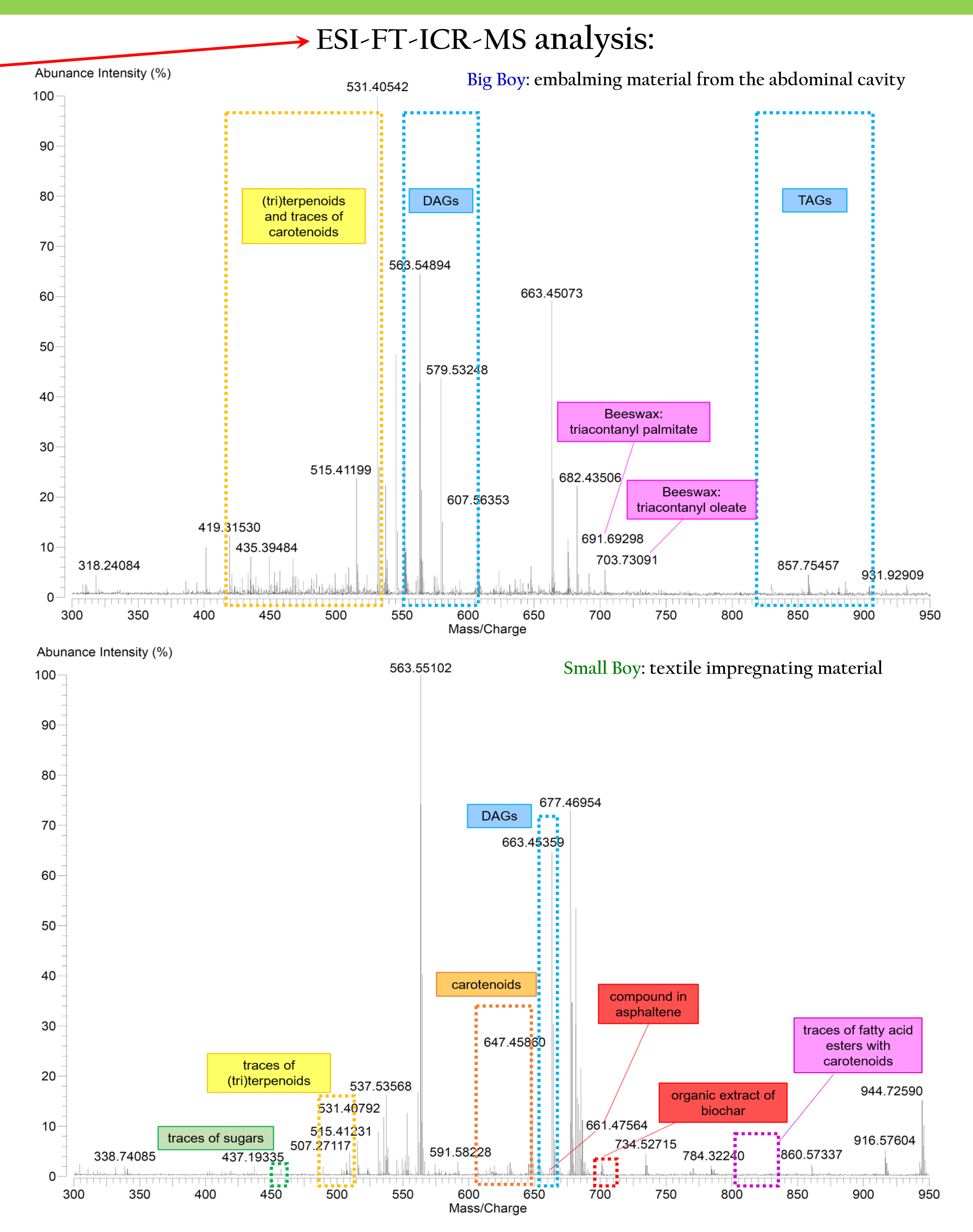
- 18 samples from the Big Boy and
- 16 samples from the Small Boy

were taken for the analysis.

A newly developed FT-ICR-MS methodology for the analysis of resinous materials (internal calibration standards introduced in reference [1]) was applied for these samples with good results.

ORGANIC MATERIALS

ESI-FT-ICR-MS analysis:



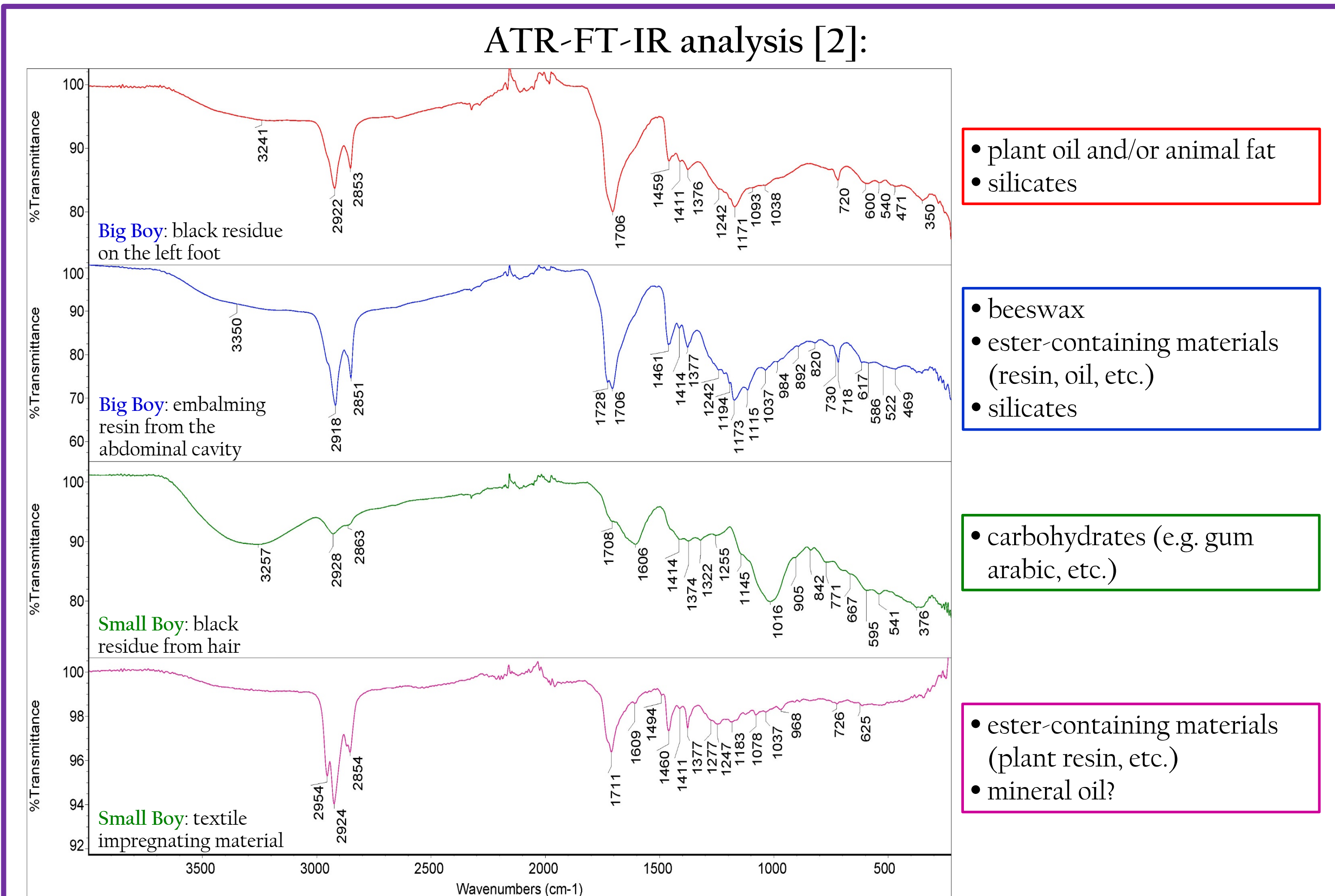
Big Boy: embalming material from the abdominal cavity

- (tri)terpenoids and traces of carotenoids
- DAGs
- TAGs
- Beeswax: triacontanyl palmitate
- Beeswax: triacontanyl oleate

Small Boy: textile impregnating material

- DAGs
- carotenoids
- compound in asphaltene
- traces of fatty acid esters with carotenoids
- traces of sugars
- traces of (tri)terpenoids
- organic extract of biochar

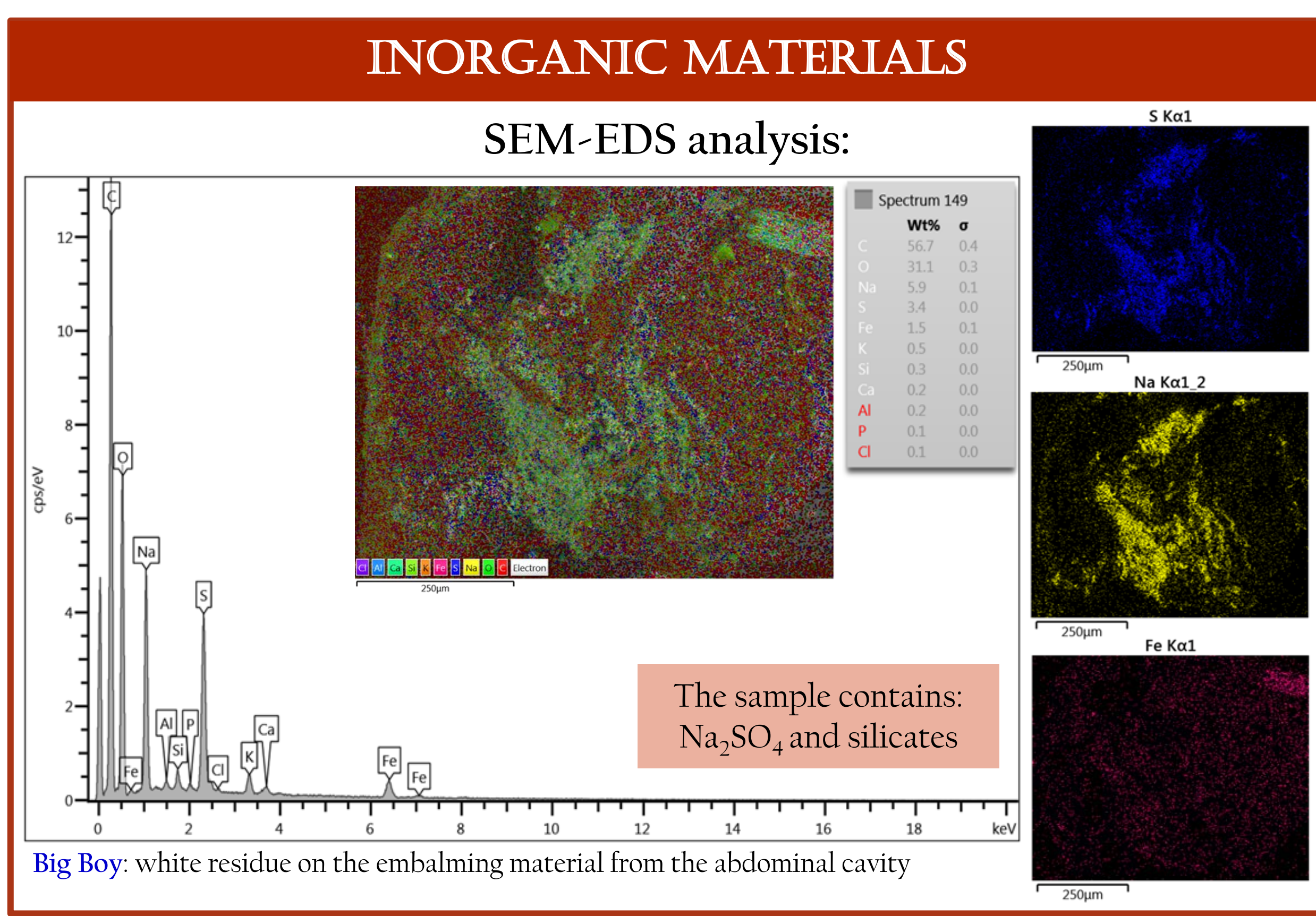
ATR-FT-IR analysis [2]:



- plant oil and/or animal fat
- silicates
- beeswax
- ester-containing materials (resin, oil, etc.)
- silicates
- carbohydrates (e.g. gum arabic, etc.)
- ester-containing materials (plant resin, etc.)
- mineral oil?

INORGANIC MATERIALS

SEM-EDS analysis:



The sample contains: Na₂SO₄ and silicates

Big Boy: white residue on the embalming material from the abdominal cavity

REFERENCES:

- Teearu, A.; Vahur, S.; Rodima, T.; Herodes, K.; Bonrath, W.; Netscher, T.; Tshepelevitsh, S.; Trummal, A.; Lõkov, M.; Leito, I. Method development for the analysis of resinous materials with MALDI-FT-ICR-MS: novel internal standards and a new matrix material for negative ion mode. *Journal of Mass Spectrometry*, 2017, 52 (9), 603-617.
- Vahur, S.; Teearu, A.; Peets, P.; Joosu, L.; Leito, I. ATR-FT-IR spectral collection of conservation materials in the extended region of 4000–80 cm⁻¹. *Analytical and Bioanalytical Chemistry*, 2016, 408 (13), 3373–3379.

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