BEILSTEIN TEST: a simple test for Halogens (Chlorides)

From: ***Spot Testing for Materials Characterization***
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PowerPoint Presentation by:

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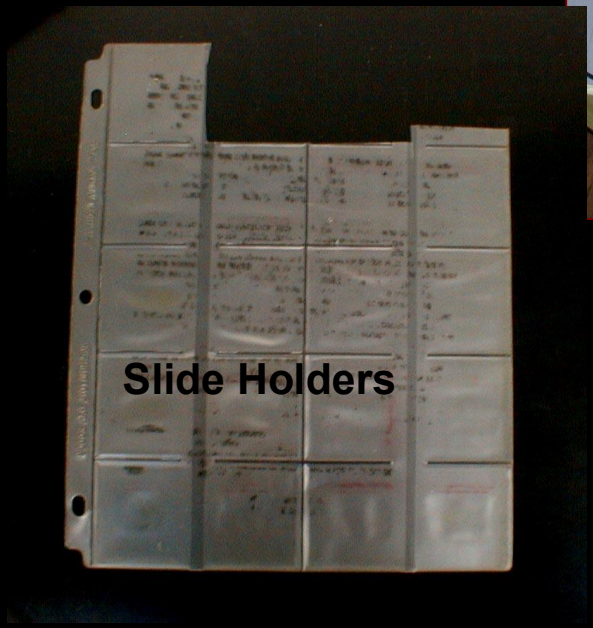
PLASTIC FILM - storage of archaeological materials



Plastic ….

is Plastic ….

is Plastic ….

Isn't it?

You have heard of testing your packaging materials for pH (ACIDITY)

So, here's another lurking danger …… and it lurks in PLASTIC.

Some remember the days when we went to the grocery store for plastic bags. And now, many years later, perhaps those bags are not doing so well.

But maybe they are OK . . . . . they may LOOK OK.

How can we find out if a plastic contains Halogens (Chlorine or CHLORIDES)

Over time, off-gassing of Chlorine from the plastic can harm artifacts. The material itself will also not last as well.

Test for Halogens Using Pyrolysis (BEILSTEIN TEST)

Purpose of the Test: Determine the presence of chlorine/chlorides, especially for materials being considered for long term storage of artifacts.

Principle Involved: A material containing bound or ionic halogens (chlorine, bromine, iodine) such as salt or polyvinyl chloride (PVC), will react with a copper wire when heated in a flame and produce a brilliant, long lasting green flame.

EQUIPMENT:

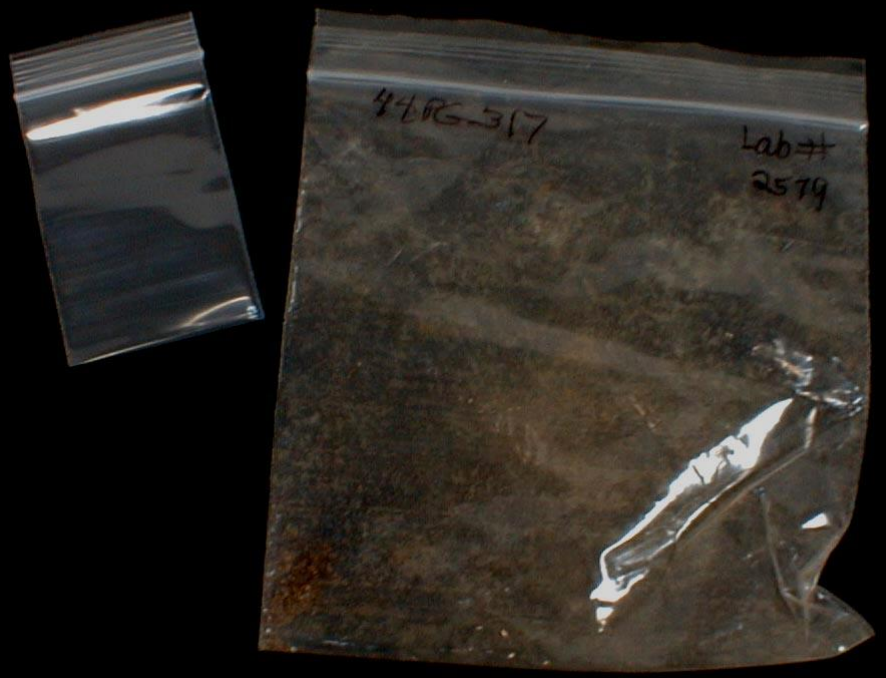
- Copper Wire
- Source of Flame

Insulated Cu Wire

Alcohol Lamp or
Cigarette Lighter

PROCEDURE:

1) Select a material that you know will give you a negative result -- as a control

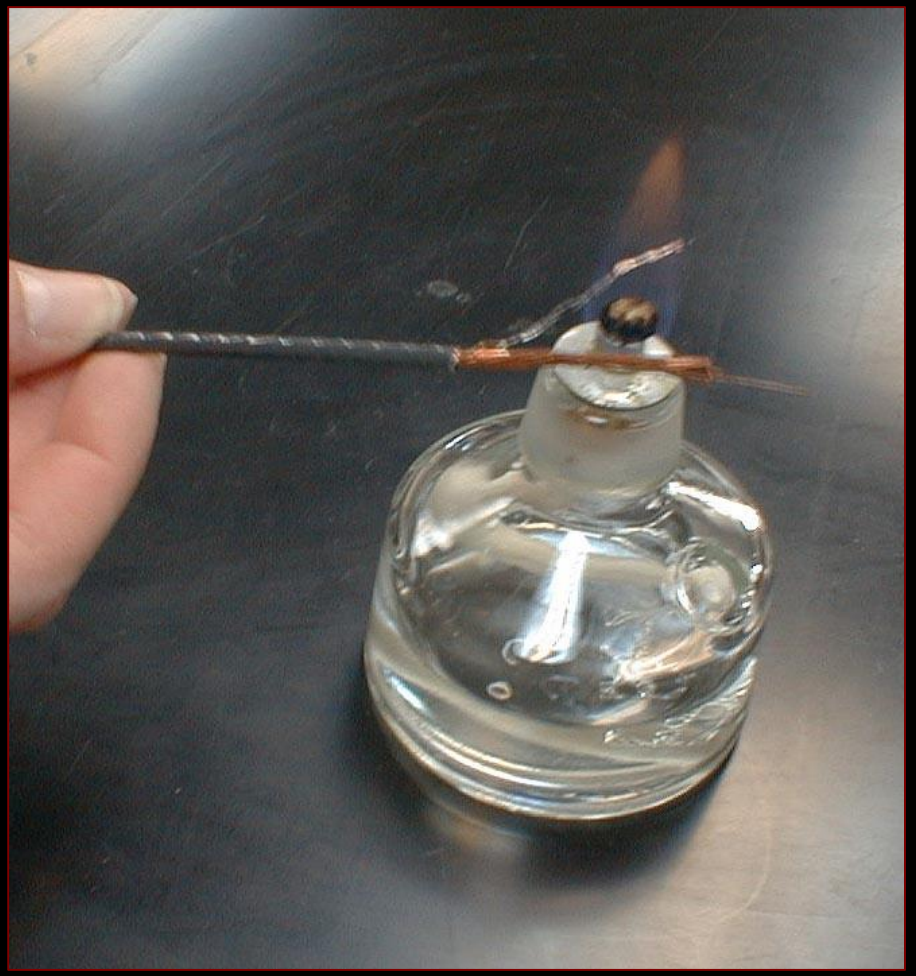


Polyethylene is good

PROCEDURE:

2) Heat the wire until it is hot enough to melt the plastic. It is necessary to hold it in the flame for at least 30 seconds

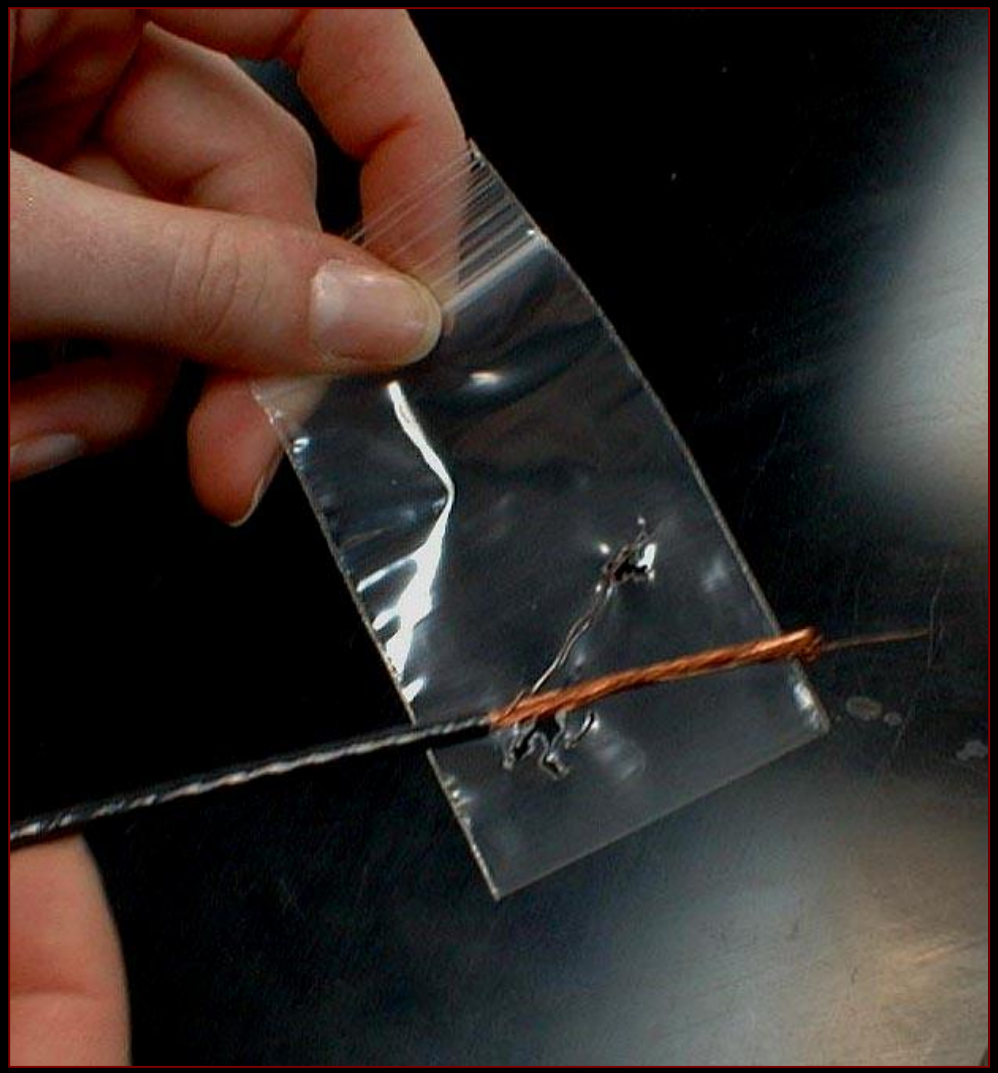
Hint: if you are using a cigarette lighter, get someone else to hold it for you



PROCEDURE:

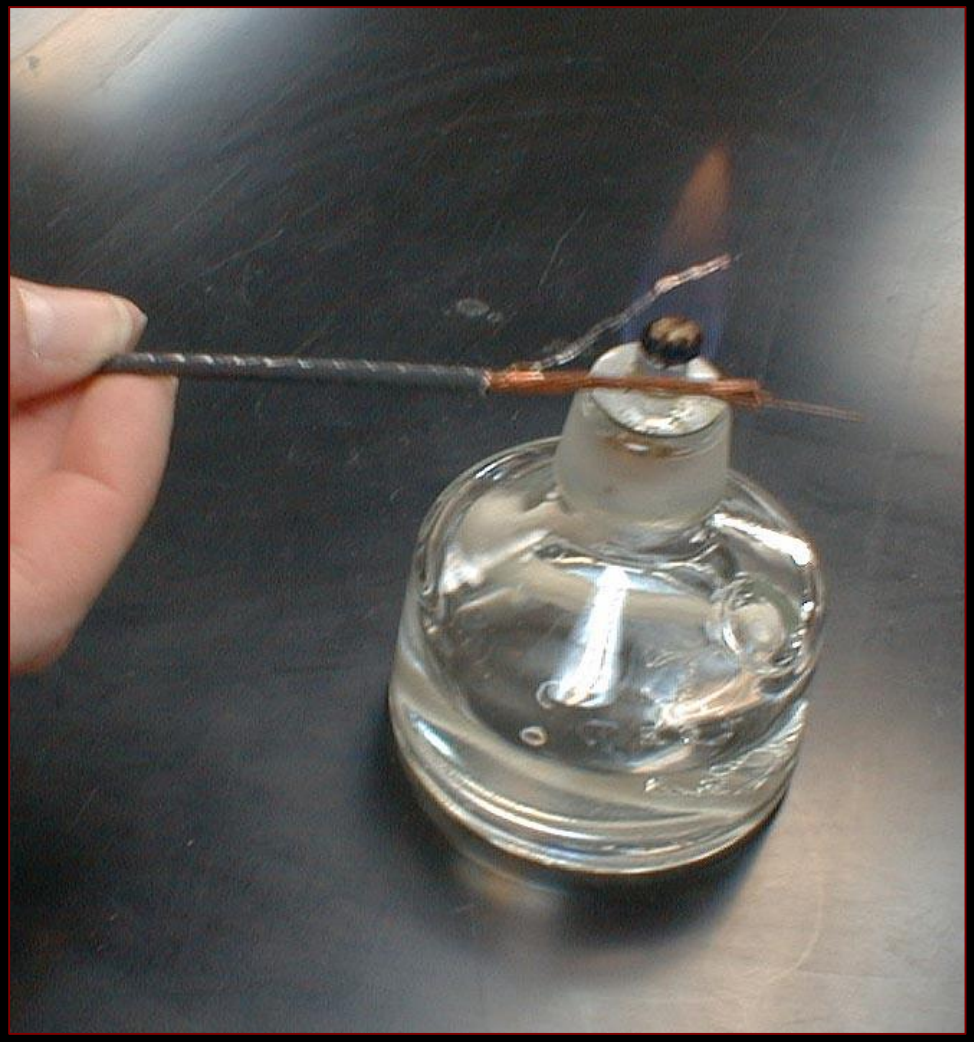
3) Jab the hot wire into the sample plastic and jostle it around until melted plastic is transferred to the wire

Hint: curling the end of the wire into a small circle or ball prior to heating it will make it stronger.



PROCEDURE:

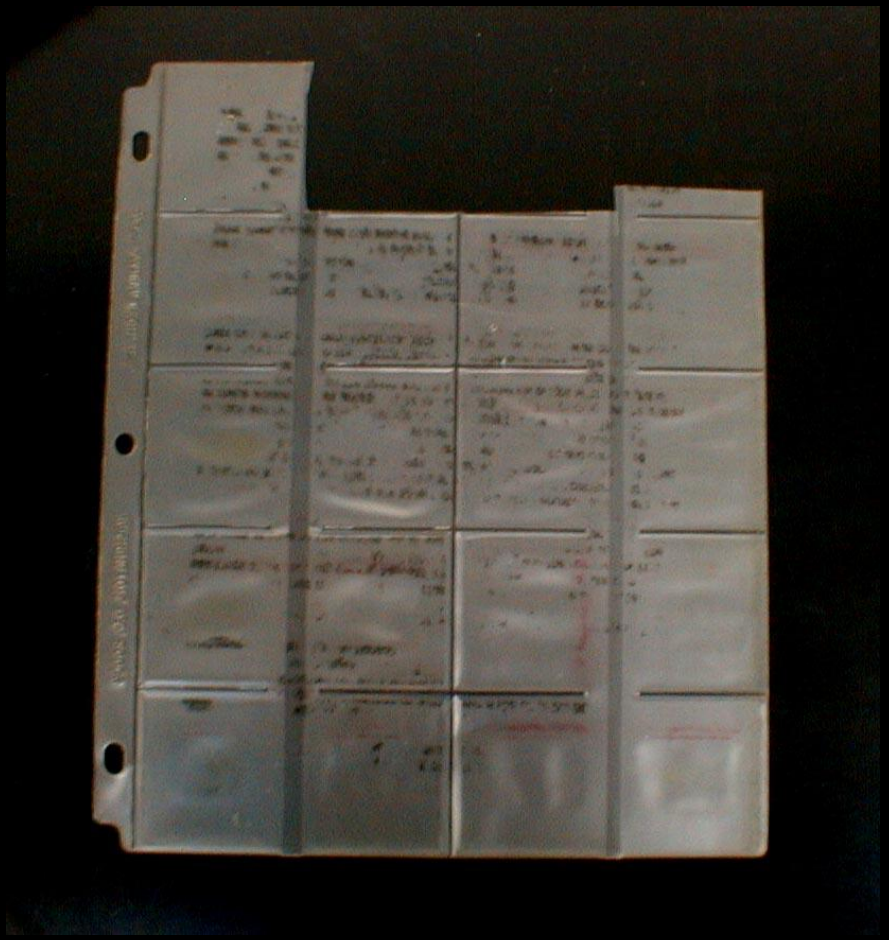
4) Return wire with tiny blobs of plastic on it back into the flame.



Negative reaction: no chlorine

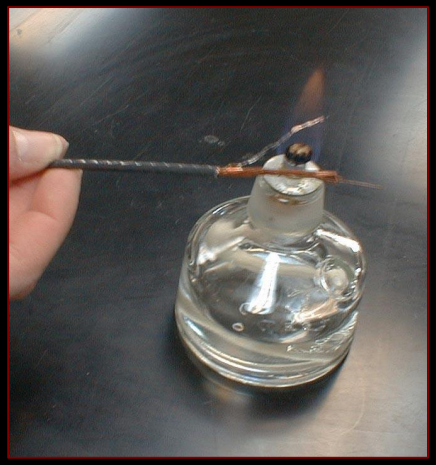
PROCEDURE:

5) Now try an *unknown*

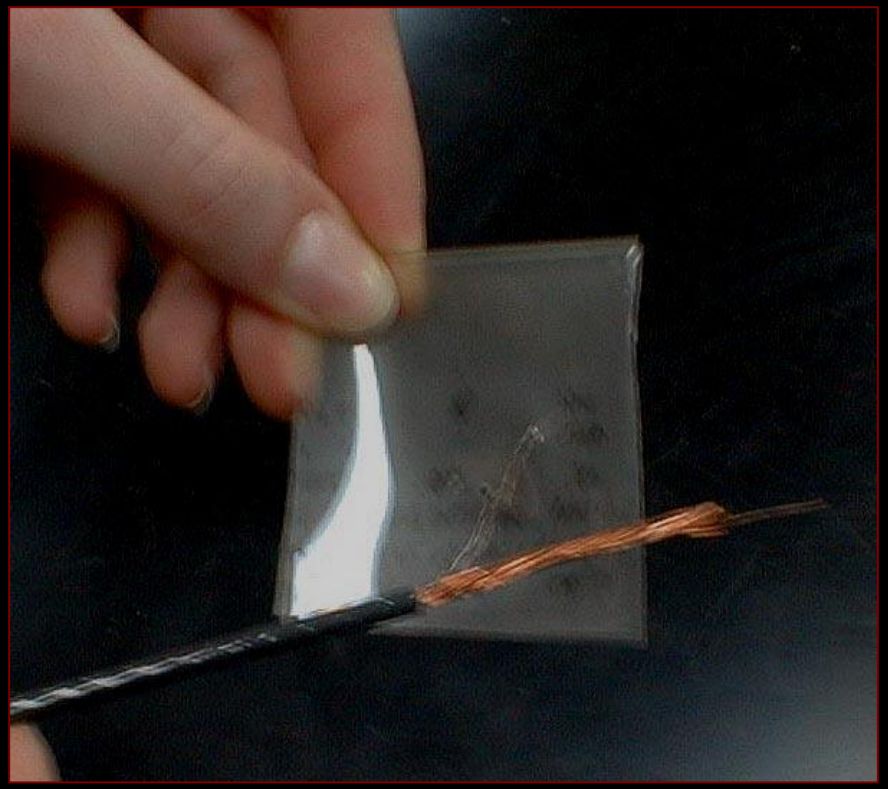


PROCEDURE:

6) Heat the wire again – either pull out a clean wire, or burn off the plastic from the previous one



7) Test the *unknown* – make sure you get the wire hot enough



PROCEDURE:

8) Back to the FLAME

VOILLA!

RESULTS:

Positive: A strong green color in the flame indicates the presence of halogens (chloride, bromide, iodide but not fluoride). The flame will burn green for a long period of time if PVCs are present.

Impurities, such as fingerprints, or surface treatments that contain chloride can give a weak green flame that disappears quickly.


DONE