

Examination of Secret writings, indented writings and Charred Documents



What is secret writing???

- Secret writing is any writing which is not visible or readable by naked eyes.
- It can only be deciphered under an appropriate light source or equipment or by heating or on suitable treatment with a chemical.



Who use secret writing???

- Prisoners
- Criminals
- Terrorists
- Intelligence department
- Drug dealers

Methods of secret transmission of data

Using invisible
ink

Miniature
writings

Latent
photographs

Cryptography

Steganography

Invisible inks

- Also called sympathetic inks, which are colorless in nature and that cannot be seen until it is treated with heat, vapor or chemicals.
- Such inks may include body secretions (saliva, urine, perspiration), lemon juice, orange juice, onion juice, milk, chemicals, soap solution, medicinal solutions etc.



Miniature writings

- The secret messages may be sent in form of a micro text.
- Even a photograph bearing small dots of inconspicuous size and shape may carry all the necessary information of secret messages.

Latent photograph

- A secret message may be conveyed in the form of a latent image on photographic bromide paper.
- The recipient develops and fixes it to read the message.
- Such documents should be carefully handled as there are great chances of their destruction as soon as it exposes to light.



Cryptography

- Cryptography is the science of creating and deciphering the codes.
- In cryptography, a cipher (an algorithm) is used for encrypting and decrypting any information.
 - **Encryption:** process of transforming any information or data into codes or any unreadable form.
 - **Decryption:** process of converting a secret code or encrypted data back into its original readable form.

1 2 3 4 5 6 7 8 9

10 20 30 40 50 60 70 80 90

100 200 300 400 500 600 700 800 900

1000 2000 3000 4000 5000 6000 7000 8000 9000

1993 4723 6859 7085 9433



3

10

1993

Meaning of 35 13 25 10 64???

35- H

13-E

25-L

10-L

64-O

Geheim!

W. Föhr. Spr. Schl.

SFM T 52 d/e

Prüf. Nr. 104

Norwegen Nr. 4

1. Tag ab 0900 Uhr DGZ

	1	2	3	4	5	6	7	8	9	10	
A	18	20	38	31	54	47	67	54	70	17	A
B	05	30	22	60	63	29	35	42	55	04	B
C	37	28	58	36	03	46	13	47	20	67	C
D	46	27	42	32	10	07	64	41	08	15	D
E	23	13	30	29	24	56	20	31	39	32	E
F	19	45	57	07	55	61	27	58	68	72	F
G	42	22	19	26	08	11	53	29	16	58	G
H	35	08	28	55	58	22	19	68	02	19	H
I	29	49	17	47	36	30	61	08	40	65	I
K	02	19	48	43	42	20	24	14	31	47	K
L	33	51	25	10	32	05	52	28	18	22	L
M	38	06	35	05	60	17	04	46	64	11	M
N	43	01	09	27	35	44	66	12	59	30	N
O	47	11	37	59	64	25	22	56	71	14	O
P	14	07	56	49	13	19	44	38	27	07	P
Q	44	25	11	21	48	28	51	17	35	29	Q
R	17	12	15	40	34	12	57	05	48	57	R
S	15	26	52	46	62	45	26	37	44	62	S
T	39	21	18	14	01	38	11	50	56	21	T
U	03	52	23	53	26	14	49	69	61	25	U
V	36	24	54	16	37	33	23	59	34	52	V
W	16	50	44	24	53	43	18	21	53	50	W
X	40	48	41	33	51	65	45	34	46	12	X
Y	34	37	20	39	18	23	33	63	36	73	Y
Z	10	53	34	45	59	02	48	16	54	37	Z
	1	2	3	4	5	6	7	8	9	10	

38 13 30 14,

M E E T

38 13,

M E

18 45 18 29 34,

A F T E R

39 08 30,

T H E

15 28 28 59 64 05

S C H O O L

Geheim!

W. Föhr. Spr. Schl.

SFM T 52 d/e

Prüf. nr. 104

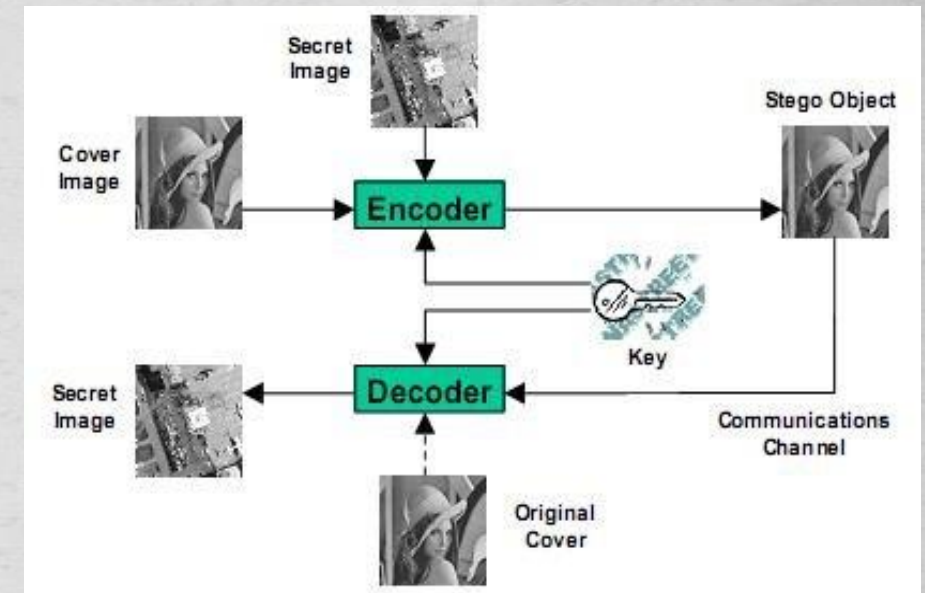
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	1	2	3	4	5	6	7	8	9	10	
A	18	20	38	31	54	47	67	54	70	17	A
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D	46	27	42	32	10	07	64	41	08	15	D
E	23	13	30	29	24	56	20	31	39	32	E
F	19	45	57	07	55	61	27	58	68	72	F
G	42	22	19	26	08	11	53	29	16	58	G
H	35	08	28	55	58	22	19	68	02	19	H
I	29	49	17	47	36	30	61	08	40	65	I
K	02	19	48	43	42	20	24	14	31	47	K
L	33	51	25	10	32	05	52	28	18	22	L
M	38	06	35	05	60	17	04	46	64	11	M
N	43	01	09	27	35	44	66	12	59	30	N
O	47	11	37	59	64	25	22	56	71	14	O
P	14	07	56	49	13	19	44	38	27	07	P
Q	44	25	11	21	48	28	51	17	35	29	Q
R	17	12	15	40	34	12	57	05	48	57	R
S	15	26	52	46	62	45	26	37	44	62	S
T	39	21	18	14	01	38	11	50	56	21	T
U	03	52	23	53	26	14	49	69	61	25	U
V	36	24	54	16	37	33	23	59	34	52	V
W	16	50	44	24	53	43	18	21	53	50	W
X	40	48	41	33	51	65	45	34	46	12	X
Y	34	37	20	39	18	23	33	63	36	73	Y
Z	10	53	34	45	59	02	48	16	54	37	Z
	1	2	3	4	5	6	7	8	9	10	

Steganography

- It is an act of hiding the information or writing behind any text or picture.
- The word Stegnography is derived from two Greek words "*Stegnos*" meaning covered or protected and "*Graphein*" means to write.
- The messages are hidden in such a way that no one apart from the sender and intended recipient can read that.

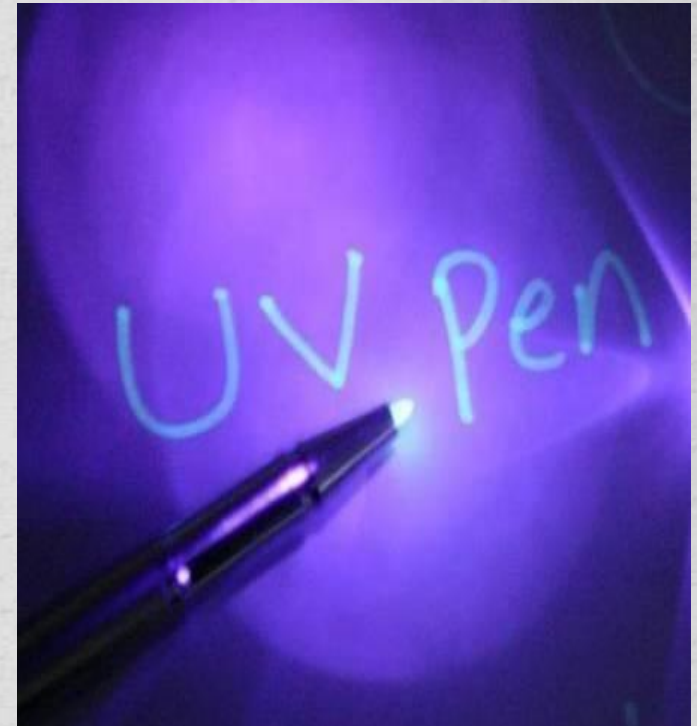


Preliminary examination of paper

- Condition of the paper.
- Color of the paper should be observed.
- The document should be examined under ordinary light, transmitted light or grazing light at various angles.
- The indentation marks are examined.
- The documents should be photographed before conducting the detailed examination.

Examination and decipherment of invisible ink

- Secret writings made using body fluids can be deciphered under UV light. The differential absorption and reflection of UV rays will help in reading the secret message.
- Some chemicals also give fluorescence under UV light.



Invisible inks



Contd...

- Messages written with orange or lime or onion juice can be conveyed by heating the document. Certain salts or organic compounds can also be examined using the same technique.
- If the writing is made with secret ink bearing heavy metals, it can be read under IR light or x-rays.

Contd...

- Geiger counter technique can be used to detect the text written with any radioactive material.
- Writings with silver nitrate solution becomes evident when exposed to strong light.
- The differential absorption of iodine fumes at the place of writings will reveal the secret text.

With lemon juice

Each microorganism has an optimal growth temperature. For most bacteria of medical importance (i.e. pathogenic bacteria), the optimal growth temperature is 37 °C, [the normal temperature of human body]. Similarly commonly studied bacteria are mesophiles, and can grow best at temperatures in between 30-40 °C. Hence to suit the temperature requirements of both the types of bacteria the working temperature of the laboratory incubator is adjusted at 37 °C. However, for certain experiments the incubation temperatures can either be lowered or increased if necessary.

- Petri dishes are incubated in inverted position (upside down). This prevents the falling of water drops, formed by the condensation of water vapors on the lid of the plate, which otherwise may lead to merging of colonies among each other.
- Broth cultures and slant cultures are incubated at 37 °C in upright position in a rack or in some appropriate containers. In order to prevent drying of the medium [when prolonged incubation is essential], screw cap test tubes can be used or the test tubes can be sealed with paraffin wax or covered with an aluminium foil.
- For certain experiments where the isolation or the study of organisms belonging to natural environment is carried out the incubation is done at ambient [room] temperatures.
- Other environmental factors can also be controlled for culturing the organisms. For example, some pathogens require an atmosphere with elevated carbon dioxide, other organisms grow only at particular humidity levels or light intensities. For this special kinds of incubators are available.

HOW TO PREPARE A SMEAR

For staining any slide it is essential to prepare a good smear. *'Smear is a thin, uniformly spreaded film of the suspension fluid on the specified area of the microscopic glass slide'*.

Procedure

1. Clean glass slides by immersing them in a liquid detergent like teepol or acid alcohol for at least 2-3 hours.
2. Wash slides in distilled water, and rub them dry with a clean non-greasy linen cloth.
3. Warm up the slide by passing it through the flame once or twice, and mark a small square or circle on the back of the slide with a glass marking pencil [if permanent glass marking pen is used there is no need of warming up the slide].
4. Turn the slide over, so that the area marked [square or circle] are on the underside.
5. Sterilize the wireloop [turn the hub of the handle along the entire length] in the Bunsen burner flame until it glows.
6. Allow the wireloop to cool between the burners, be careful not to touch it to any surface.
7. Put a small amount of distilled water in the center of the area marked on the slide. [Do not use water when smearing a broth culture].
8. Hold the culture tube at an angle in your left hand, remove the cotton plug or screw-cap with your right hand and flame the mouth of the culture tube.
9. Insert the sterile, cooled loop into the culture and remove a little amount of the growth [colony] or a loopful of broth from a liquid medium.
10. Remove the loop from the tube carefully to avoid touching the sides of the tube with the charged loop.
11. Flame the mouth of the tube, and quickly replace the plug or cap to the tube. Place the tube aside in the rack.
12. Place the culture in a water drop, mix it well and spread it uniformly over the marked area [if the broth is being used, do not spread out too thinly, as the bacterial cells will be widely separated, making it difficult to locate during the microscopic examination].
13. Flame the loop and place it aside.

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3:45:14 4/20/2010 Lights=365,312, Longpass=500, Bandpass=Off, Mag=25X

Auto Exposure (Integration=1/8, Iris=79%, Gain=128X), Brightness=Auto, Contrast=Auto, Imaged with =144.88 mm

8.6.1. COMMERCIAL PRODUCTION :

Solvent extraction method is widely employed, particularly in our country, for production of rice bran oil on large scale. Rice bran miscella thus obtained is a mixture of 15-20% of rice bran oil and 80-85% of solvent, namely, 'hexane'. This mixture is separated into solvent and oil- portions by heating at various stages under vacuum. The solvent vapours are condensed and re- circulated into the system. The finished oil is cooled and pumped to storage tanks for deodouring, dewaxing, refining, degumming and fortification. Fig. 8.6 shows details of extraction of rice bran oil and refining procedure.

Refining Procedure :

Rice bran oil refining is an essential requirement and is completed by means of following steps :

a. Filtration :

The oil is first subjected to filtration which removes the solid impurities.

b. Dewaxing :

Rice bran oil contains on an average 2.5-3.0% of wax. It has been found that by keeping the oil solvent mixture at low temperature the wax settles down and the supernatant miscella is easily pumped out.

c. Bleaching :

This has been successfully done using oxalic acid, tartaric acid as well as maleic acid in combination with hydrogen peroxide.

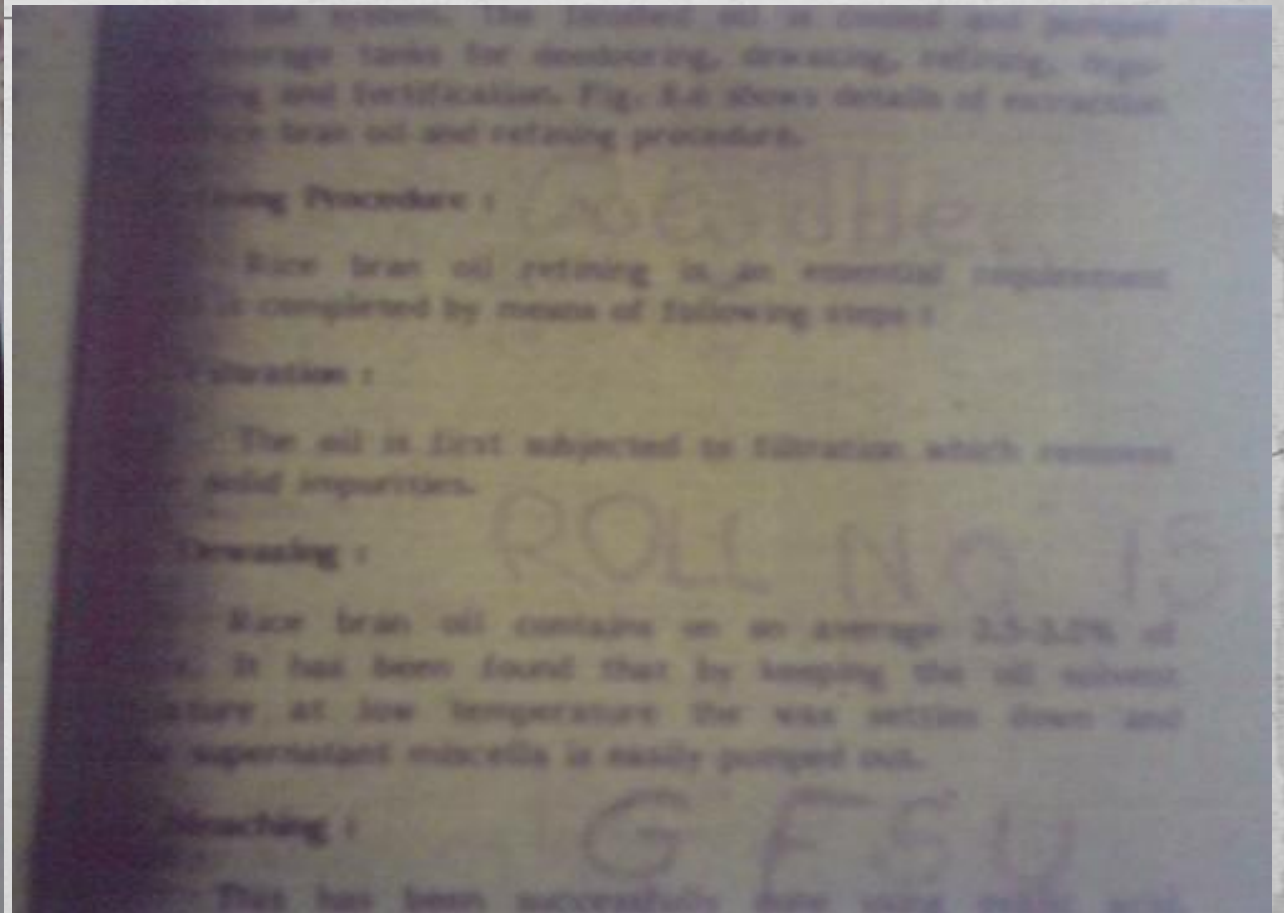
d. Deodouring :

Deodouring of rice bran oil is done by traditional, closed steam cool heating under vacuum.

e. Lowering Free Fatty Acids :

Lowering free fatty acids of rice bran oil from 10-60%

With orange juice



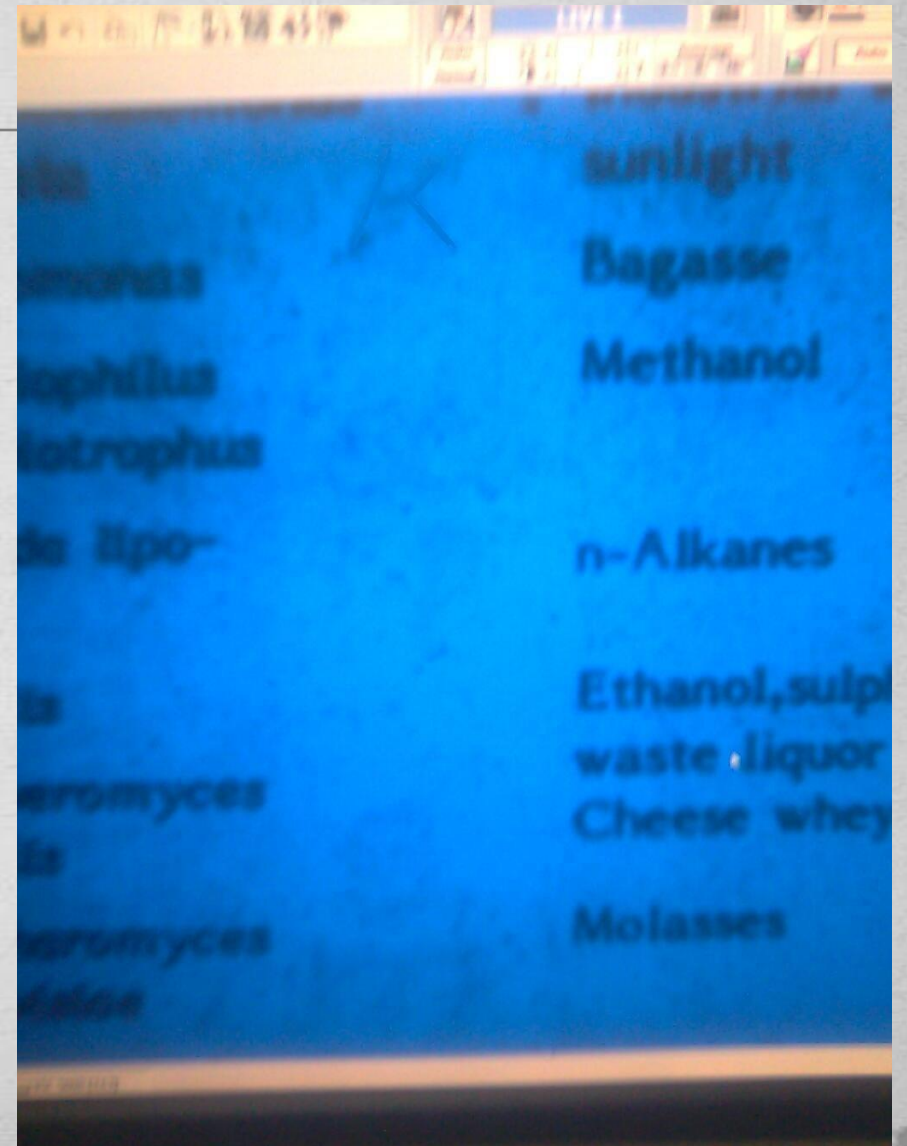
8.5.2. MODERN STORY OF SCP :

The modern story of SCP started in Germany during World War I. Scientists and technologists in Berlin devised a process by which brewers' yeasts, *Saccharomyces cerevisiae*, were grown in large quantities and added to sausages and soups to supplement the nation's diminished food resources. Eventually the yeasts made up more than half of the country's restricted food imports. Again during World War II, Germany turned to yeasts, this time employing

Microbes	Raw Materials	Crude Protein % (approx.)
<i>Spirulina maxima</i>	CO ₂ , NaHCO ₃ , sunlight	60
<i>Scenedesmus acutus</i>	CO ₂ , sunlight	55
<i>Rhodospseudomonas capsulata</i>	Industrial wastes, sunlight	60
<i>Cellulomonas</i>	Bagasse	85
<i>Methylophilus methylotrophus</i>	Methanol	70
<i>Candida lipolytica</i>	n-Alkanes	65
<i>Cutilla</i>	Ethanol, sulphite waste liquor	50
<i>Kluyveromyces fragilis</i>	Cheese whey	50
<i>Saccharomyces cerevisiae</i>	Molasses	50
<i>Cephalosporium cichorii</i>	Cassava starch	50
<i>Chaetomium cellulolyticum</i>	Agriculture and forestry wastes	45
<i>Paezilomyces varioti</i>	Sulphite waste liquor	55

Candida species. In Britain, brewers' yeasts have made a contribution to the diet for many years, the excess microbes being sold as animal feed or produced to form

With saliva



Miniature writings

- Such type of writings are first examined using magnifying lens under normal lighting conditions to locate the traces of miniature writings, if any.
- The writings will be clearly evident under stereomicroscope which can further be enlarged using sophisticated instruments.



Latent photographs

- If an IO encounters any packet containing some material or paper wrapped in black or brown paper, it should be immediately sent to the laboratory for examination.
- Such packets should be opened under the dark conditions.
- If a piece of photographic paper or film is found, then should be first examined under the microscope.
- The paper should then be developed using appropriate developer and fixers to reveal the secret text or markings.

Codes and ciphers

- Any document bearing any text in unreadable format should first be photographed in its original form.
- There are different techniques, information, books available for coding and cipher. The expert should have sufficient knowledge about handling such difficulties.
- In case of some hidden text, attempts are being made for search and seizure of the computer from which that secret message has been originated.

Instrumental techniques

- Hand Magnifiers
- Stereomicroscope
- Vispec-5000
- Projectina
- UV lamp
- Video Spectral Comparator (VSC)
- Infra red filter camera
- ESDA

Instruments	Secret writing
Stereo microscope	Disturbed surface, Miniature writing
U.V. lamp	If ink shows fluorescence under UV
I.R. photography or X-Ray	If heavy metal is used
Geiger counter	If radioactive substances are have been used
ESDA	Indentation mark of secret writing
AAS, FTIR, AES	Composition of secret ink

Charred Document?

- The document which is partially or completely burnt.
- A document that has become blackened and brittle by burning or exposure to excessive heat is classified charred document



Contd...

- Sometimes the information present in the burnt document is of great importance for investigation.
- Charred documents are very fragile and are easily destroyed in the mailing process. So, such type of document requires special attention while collection and examination.



Fig. 1.4: Pictorial representation of charred documents

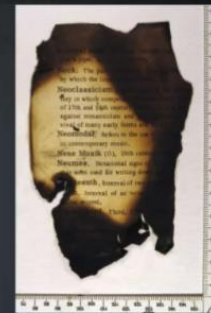


Fig. 1.5: Photograph of a single charred document with the ABFO scale.

Effect of heat and temperature on paper

- Excessive heat leads to loss of moisture from the paper surface resulting in extreme dryness.
- Charred document becomes blackened and brittle from being exposed to high heat.
- Furthermore, paper tends to curl because the different expansion of burnt fibers on both sides of paper.



Handling, Collection and transportation of charred document

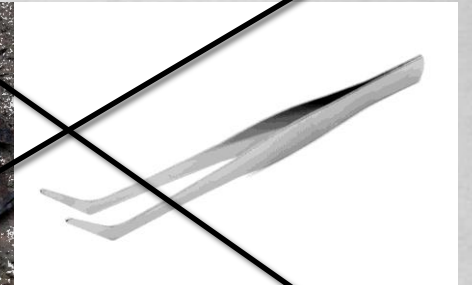
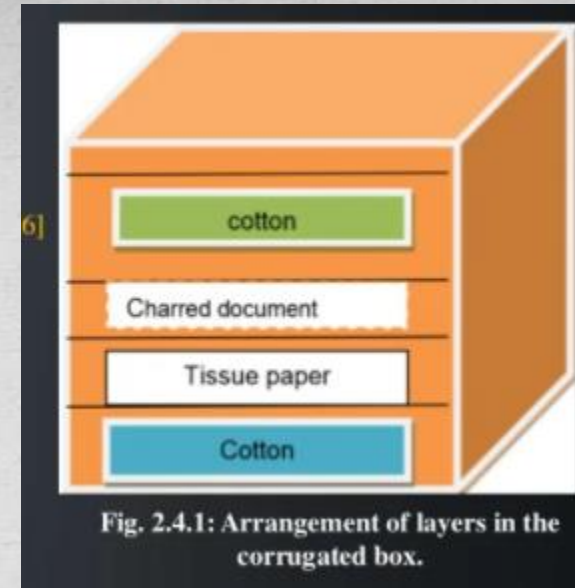
A. For documents found in open area

- Place a box or open end container (appropriately labeled) over the charred evidence to prevent it from being destroyed or blown away.
- The charred contents should be carefully lifted using thin cardboard sheet or metal plate and should be placed in cushioned cardboard box.



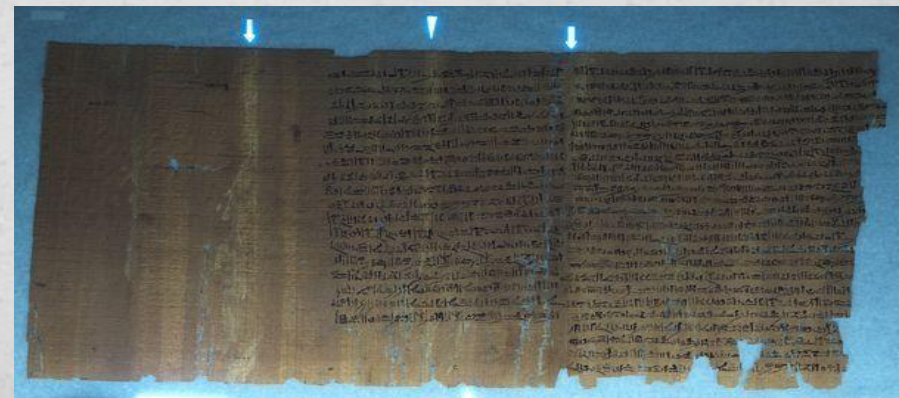
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- Light weight absorbent cotton or tissue paper should be used for providing proper cushioning to the charred evidences.
- It is usually not advisable to use tweezers for picking up the fragments.



B. More fragile documents

- Sometimes, the charred documents are so much fragile that they cannot be removed from the site safely. It is advisable to lightly spray a stabilizing mist of 2-3% of polyvinyl acetate on the surface of the document to impart sufficient tensile strength to permit later removal.
- To straighten the curled edges, it should be kept in humidifying chamber for few days.



C. Fragments found in waste baskets or other open container

- These documents should be transported to the laboratory in the same container in which they were found. If necessary, use light packing of cotton wool around the chars.
- The charred fragments present in file drawers should be transported by removing the drawers from the cabinet.
- No forceful attempt should be made as it can destroy the document.



D. Water soaked documents

- Such type of documents are encountered at the scene of fire. They may either be water soaked or both burnt and water soaked.
- Such documents should be lifted by inserting a fine wire screen beneath them for allowing water to run off from the top of the documents.
- Thin metal plate is not recommended for lifting of these documents as they tend to slide on the surface of the plate.



Stabilization of charred documents

- The charred documents can be fixed either between two transparent sheets or on transparent glass sheet to carry out examination.
- 2-3% polyvinyl acetate in acetone (other organic solvent in case of ball point pen writings) should be sprayed on charred mass.



- 1.2% boric acid with 0.4% sodium hydroxide is sprayed lightly on charred mass. This makes it flexible. After that 10% formalin solution is sprayed which helps in unfolding the charred documents.
- To prevent charred documents from adhering, the glass plate is treated first with 1% solution of silicone in petrol ether.
- The charred mass should be separated from one other by treating with sufficient quantity of acetone.

Methods for decipherment

A. Contact print photography

Place the document between two unexposed photographic plates tightly and keep the arrangement in light proof box for 15 days. The plates were later developed to decipher the text.

B. By reflected light

The document is examined under ordinary light at different angles. The writings are made visible as the reflecting power of the surface has been modified.

C. Using oblique light

The indentation marks on the charred documents can be best examined under oblique lighting condition

D. UV & IR photography

This depends upon the ink composition and extent of charring.

E. Treatment with chloral hydrate

The charred text can be deciphered and photographed by spraying 20% chloral hydrate in ethyl alcohol.

F. Treatment with silver nitrate

The document is kept in 5% silver nitrate solution in water. Absorption of silver nitrate makes the writings visible depending upon presence of reducing agents present in the ink. The writing developed is visible as black image against grey background paper.

G. Treating with alcohol glycerin emulsion

The charred writings can be deciphered by placing the document in alcohol glycerin emulsion made by mixing 5 parts of alcohol in 3 parts of glycerin and 2 parts of distilled water.