

■ REVIEW ARTICLE

# Charred Documents and the Techniques used for their Forensic Examination: An Update

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## ABSTRACT

A number of publications have been published pertaining to the forensic analysis of the questioned documents. Along with that new methods and techniques have been used nowadays to solve the question document cases. Questioned documents are those documents whose legitimacy or authenticity is disputed. Often, the documents are demolished by burning and different intends to cover crimes termed as charred documents. Charred documents are a sort of questioned documents that are probably to contain crucial data. These types of documents are principally connected to ransoms, arson case, accidental fires, financial and insurance issues, extortion, suicide, white collar crimes etc. The present article reviews the introduction to charred documents, the cases in which charred documents are supposed to found, their handling and all the related information up to their forensic examination.

**KEY MESSAGES:** Charred documents are found in arson cases, sudden fire accidents, financial and insurance disputes, etc. Documents may be willfully burnt or destroyed with the intention to hide crime or to destroy evidence. Charred documents at the crime scene should be handled with utmost care as they are too fragile to be handled casually.

**KEYWORDS** | charred document, fragile, arson, questioned document, handwriting enhancement

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## INTRODUCTION

**A** DOCUMENT IS A PIECE OF PRINTED, WRITTEN, or electronic matter i.e. generally consisting of signatures, handwritings or some modified data providing information that makes a record. Questioned documents are those documents whose legitimacy or authenticity is disputed.<sup>1</sup> Papers are made up of cellulose fibers, derived from the sources including the wood, rags, grass etc. which are further chemically treated to discard the undesired components such as lignin, resin etc. This is further followed by the draining of water leaving the soft moist mat of interlaced fibers. After this, the moist mat is dried by the heat and pressure and resulting in the paper.<sup>2</sup> According to the Indian Penal Code (IPC), document is defined in the section 29, states

that, "The word document denotes any matter expressed or described upon any substance by means of letters, figures or marks or by more than one of these means, intended to be used or which may be used, as evidence of that matter".<sup>3</sup> Charred documents are defined as, "A document or a record that has gotten darkened and fragile by burning or subjecting to extreme heat is named as charred or burnt document." Charred documents are mostly found in the arson case, sudden fire, deliberate fire, revealing of examination papers, financial and insurance issues etc.<sup>4</sup> Burning of documents is one of the techniques utilized by the culprits to demolish the evidences.<sup>5</sup>

The present article gives a brief introduction to charred documents, the cases in which

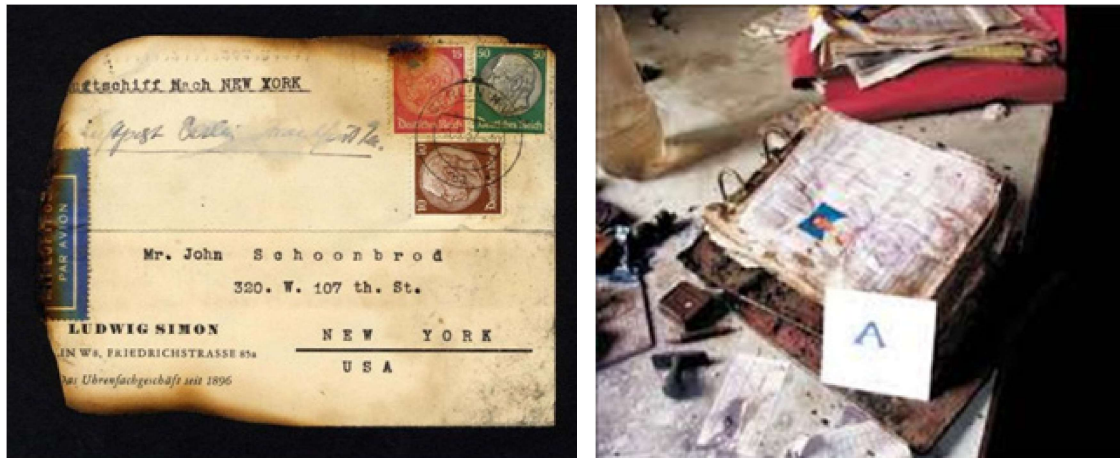


Figure 1: Showing a sample of some of the charred documents

charred documents are supposed to be found, at crime scene, their handling and all the related information up to their forensic examination & the tools and techniques have been reviewed in this paper.

### Principles of Forensic Document Examination

The forensic document experts deal with the questioned documents or can say with the questions of those documents whose authenticity is disputed. To determine whether a document is genuine or not, an examiner may attempt to confirm who created the document, determine the timeframe in which it was created, identify the materials used in its preparation or uncover modifications to the original text. Documents can be examined for evidence of alterations, obliterations, erasures and page substitutions. The ink, paper, writing tools, ribbons, stamps and seals used in production of the document may all reveal important clues. The examiner may even discover valuable evidence in a document's invisible impressions.

The forensic examination of the documents consisting of handwriting and signatures based of the following three principles:

1. No two persons can write the same way.
2. There is always a range of natural variations in handwriting.

3. No writer can go beyond his skill level.<sup>4</sup>

### METHOD

**Search Action & Study Selection:** A systematic search was done thoroughly on various papers related to the charred documents, their examination & instrumentation on 'PubMed', 'Google scholar', 'Web of sciences' and 'Research gate', along with many news articles, internet sources also taken into consideration. A comprehensive search methodology was put into action to include all the points in the review paper. The preliminary investigation was done on Google Scholar, which gave promising results and updates. Among the results found, authentic and published papers were used as the first basis of gathering information were studied and analyzed independently.

### Methods for the examination of charred documents:

There are several tools and techniques used for the examination of questioned documents. In this section, those tools and techniques have been represented followed by the crime scene investigation of charred documents, their handling & transportation and the decipherment methods.

### Tools and techniques used in questioned documents



Figure 2: Showing the charred documents found at the scene of crime

<p><b>Basic Measurement Tools</b></p> <p>Scale Protractor</p>	<p><b>Magnification &amp; Light Sources</b></p> <p>Magnifiers: Magnifying Glass Microscopes: Stereomicroscope, Light Microscope</p>	<p><b>Chromatography</b></p> <p>TLC, HPLC GC, MS</p>
<p><b>Basic Measurement Tools</b></p> <p>Infra-red Spectroscopy FTIR, Raman Spectroscopy UV-Visible Spectroscopy XRF</p>	<p><b>Magnification &amp; Light Sources</b></p> <p>Photography tools Computers, Visual Spectral Comparator, ESDA (Electro- static Detection Apparatus) Electrophoresis</p>	<p><b>Chromatography</b></p> <p>TLC, HPLC GC, MS</p>

Figure 3: Showing all the tools and techniques used in the forensic examination of documents.

The tools and techniques used for the examination of questioned documents are represented in the following figures shown above (Fig. 3).

**METHOD**

**Crime Scene Investigation of charred documents**

During the field investigation, the charred documents at the crime scene should be handled with utmost care due to the fragile nature of documents. So, to prevent pointless breakage, proper care should be taken and proper procedure should be followed. The crime scene investigation should be carried out as follows:

1. Protect and secure the crime scene.
2. The crime scene should be preserved with the least possible disturbance of any physical evidence and contamination.
3. Proper maintenance of the documents and all the related details at the crime scene.
4. Firstly, separate the unburnt, evidential documents at the crime scene and keep them under the custody.
5. The documents should be photographed at the crime scene on arrival as a proof further in the legal proceedings to prove that these documents were actually recovered from the scene of crime.

**Handling and Transportation of the Charred Documents**

Proper handling and transportation of charred

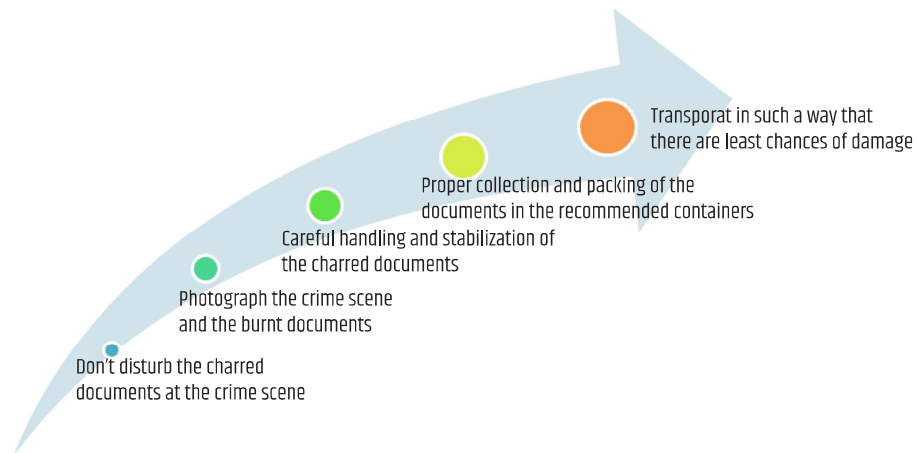


Figure 4: showing the methodology being followed at the crime scene for charred documents

documents should be carried out as follows:

1. The crime scene should be secured.
2. Restrict the flow of wind by closing the windows and turning off the fans. This means burning of documents or other materials is also restricted.
3. The container that holds the burnt documents should not be bothered unless transported to the laboratory.
4. When there is a stack of charred documents, make an effort to secure partially burnt documents from the central and middle part of the stack as unburnt documents may be obtainable due to incomplete burning.
5. Do not disturb the heap of papers. Let them be in their original position.
6. The scattered papers should be lifted carefully by using a spatula and then transfer to the sheet of glass. Place a cotton over that and transfer to the cardboard box one after the other.
7. Use plastic sheets for preservation.
8. The transportation of the exhibits should be done in a way so that there are least chances of damage.
9. Handling of charred documents requires a great patience and care.

#### Collection & packing of charred documents

1. Close up photography with a high resolution camera at the scene of crime should be done

- of the burnt or charred documents prior.
2. Wet and burnt documents should be sent to the chilled storage to avoid the cast formation.
3. Place the documents under the controlled air condition to eradicate the moisture.
4. To provide strength to the charred documents, the solution of polyvinyl acetate (3%; 3gm polyvinyl acetate in 100 ml acetone) or methyl methacrylate should be sprayed out on the burnt documents. By doing this the charred documents would gain some weight and can be placed on glass for further examination.
5. The charred documents are usually found twisted or curled. So there is a need to carefully remove or segregate those curled sheets.
6. No forceful attempts should be made.
7. All the documents should be dried, restored and refilled.

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#### METHOD

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#### Decipherment of charred documents-

Deciphering of charred documents can be done in the ways shown above in Fig. 5.

The methods for the decipherment of Charred documents are explained below.<sup>7,8</sup>

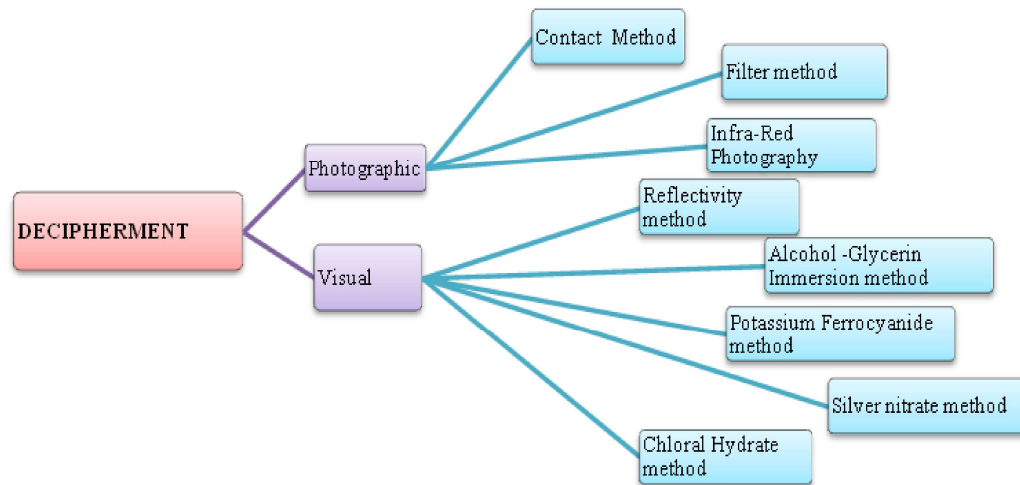


Figure 5: showing the decipherment methods for the charred documents

### Photographic Methods:

- Contact method - In this method, the fragment brought in contact with the certain gases and vapors without exposure to light.
- Filter photography - This method requires the Wratten # 48 deep blue filter paper along with a commercial film. This method helps to differentiate between the charred documents background with the printing ink containing papers.
- Infra Red photography - It is one of or highly broadcast method for the decipherment. This method involves the Wratten 87, deep red filter in combination of the Eastman infra plates.

### Visual methods

- Reflectivity method - Among all the decipherment procedures, the reflectivity method is one of the simplest and versatile methods. This method involves the examination of charred documents directed at various angles relative to the paper surface under a controlled light source.
- Alcohol - glycerine Immersion method- In this method, the charred documents are immersed in a solution of alcohol-glycerine dissolved in a ratio of 5:3:2 i.e. alcohol, glycerine and water respectively for a varying intervals of time.
- Potassium - ferrocyanide method- Iron is found in all variety of writing inks which are available and in use nowadays. Some chemical reagents results in the formation of a color compound when they get combined with the iron. So, this kind of phenomenon is also used to decipher the writings on the charred documents under some ideal conditions the traces of iron base inks present on paper will give positive reactions.
- Silver nitrate method - 5% silver nitrate (aqueous) solution is poured on the piece and then second glass plate will be placed over that piece. Direct sunlight should be avoided and after three hours the writings will be deciphered against the gray background of the paper as a black image.
- Chloral hydrate method - In this method the fragments of charred documents immersed in the 25% of the chloral hydrate solution dissolved in the alcohol and then drying at a temperature of about 600 C. After the fourth or fifth immersion, ten percent of the glycerine will be added to the same solution and dry it as same as before. The crystals of chloral hydrate will be deposited on the charred paper surface which can be further deciphered by the reflectivity method making it likely to read the characters at

certain angles of reflected light.

- f. Visual spectral comparator (VSC) - The VSC provides a good, reliable and alternative approach to enhance the writings on the charred documents. For the same, the white spot light and flood light settings can be used to decipher the writing.<sup>1,6,7</sup>

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### CONCLUSION

The documents are often getting burnt intentionally or accidentally. Such burnt documents are often recovered in the arson and fire investigation cases which may be containing significant evidentiary importance and crucial information which may be linked to the case, crime and investigation and demands the decipherment. Such documents may be related to the ransoms, extortion, suicide and any other offenses. Charred documents are extremely delicate, brittle, blackened and become fragile due to the heat exposure and may get shattered into the smaller sections or ashes. Charred documents are not containing any actual shape and often twisted around the borders. So, there is a need to handle the charred documents very carefully and with a great patience. Handling and decipherment of charred documents is one of the challenging tasks in the field of questioned documents. Therefore, the handling of the charred documents should be done carefully and separately. Tweezers should be used to lift the pieces and those pieces should be placed in the boxes and tightly shut. The moisture contents should be minimized. The transportation of the charred documents to the laboratory is another challenging task

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which might be taken seriously. Therefore, the charred documents needs careful handling while collection, packaging and transportation to the laboratory. With the help of suitable techniques, possible matters on the charred documents can be easily deciphered which might be helpful in the crime investigation. **IJFMP**

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