

Exploring the Similarities between Complete and Initial Signatures of an Individual for the Purpose of Author Identification.

Bhoopesh Kumar Sharma, Pooja Prakash, Sharon Ann Philip



Abstract: Signature is a written depiction of someone's full name, nickname, or a simple letter that has been used on any desired document as an indication of their identity. It is a particular case of handwriting, which includes flourishes and special characters which are produced by the force of habit. Forensically, the signatures are examined for naturalness in execution and for consistent recurrent options that confirm the established practice pattern of the author and aids in the identification of the author in cases of disputes. Commonly used parameters for the signature analysis by the handwriting experts are the formation of the letters, alignment, embellishment, spacing, pen-lifts, pen-pauses, slant, initial & final strokes, and pressure. In some instances where people make initials instead of full signatures, it becomes challenging for the forensics and handwriting experts to compare such initials with complete signatures. The present work has been focused on extracting the similarities between the initial and the complete signatures of an individual to aid in the identification of an individual in such complicated cases. This study may contribute to the identification of the author in the matter of disputes where initials have been used intentionally or unintentionally.

Index Terms: Signatures, Handwriting Characteristics, Author Identification, Initial Signatures

I. INTRODUCTION

Handwriting can be anything written, typed, inscribed, printed, or symbolized to transfer meaningful information to the recipient. It is a neuromuscular process that is coordinated by the brain; therefore, the handwriting legally can be described as 'Brain Writing' [1]. Based on the above fact, each has a specific writing habit that remains the same throughout life, after acquiring the stage of puberty until any external factors affect it.

Signature is a written depiction of someone's full name, nickname, or a simple letter that has been used on any desired

document as an indication of their identity [2]. It is a special case of handwriting which includes flourishes and special characters which are produced by the force of habit [3]. When the forger tries to forge the signature, it doesn't follow the unconscious habit of the writer as everyone has got their own specific writing habit already coordinated which doesn't change until a serious affect has happened to the individual [4]. According to Y. M. Al-Omari Signature identification and verification system can be classified into two ways. Off-line & on-line technique [5]. Off-line technique talks about collecting signature in a piece of paper and scanning the signature using computer to further visualize it. In an on-line technique the signature is itself signed on a digitizer and information such as speed pressure will be captured in addition [5]. Previously in a study handwriting analysis has been done using a forensic tool, GRAPHJ which automatically detect the quantitative measurements of parameters such as the size of the letters, the position of 'I' dot, the shape of strokes, dimension of the words and letters and spacing using algorithms [6]. In another work, the similarities and dissimilarities on two different sets of handwriting by two different famous individuals from Indian history were studied. The parameters used by the researcher for comparison were movement, skill, slant, alignment, size, shading, pen pressure, and pen position. They concluded the coincidental similarities that are found among the signatures, which can further lead to an understanding of brains similar to neurotransmitters [7]. Liwicki et al.; in 2014, studied on detecting forgeries either disguised or simulated from genuine signature using an automated system for signature identification and verification with the help of trained FHE's. They found that the simulations system produced excellent results, and the efficiency of automated system is as good as the manual human decisions [8]. Initial Signatures are short signatures representing your full name, which is equally acceptable in a document like full signatures [9]. Mostly initial signatures are the first two letters of the name or a word that forms part of the phrase. People use initial signatures on documents as they have a very long name and hence give short forms for their names or uses the initial letter of their name as signature. Another reason to use an initial signature by people is to save time, especially seen among professionals such as doctors, professors, engineers, teachers, etc. The signatures are usually examined for naturalness in execution and for consistent recurrent options that confirm the established habit of the author.

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Then the questioned signature is reviewed to ascertain the naturalness within the writing. After analyzing the parameters in both acknowledged and question signatures, they will be compared with each other. The parameters commonly used signature analysis and identification are alignments, embellishment, spacing, pen-Lifts, pen-Pauses, slant, the crossing of 'ts' & dotting of 'i's, initial & final strokes, and pen pressure [10].

Some people have got both full signatures and initial signatures. The purpose of the study was to find the similarities between full signatures and initial signatures so that these similarities can be used effectively by the handwriting expert in the identification of disputed authorship.

II. MATERIALS & METHODS

The primary objectives of the present work were:

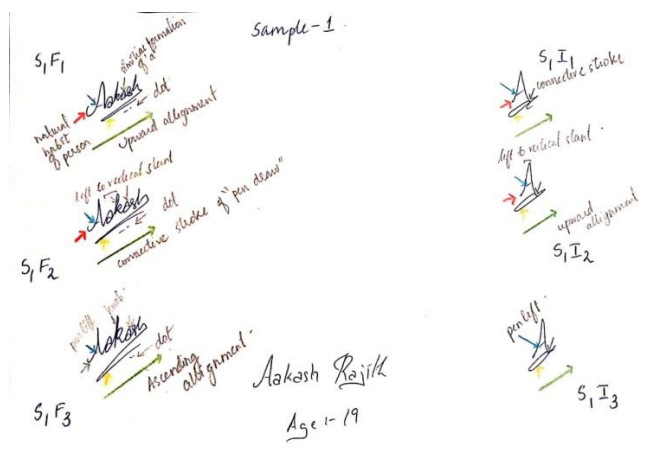
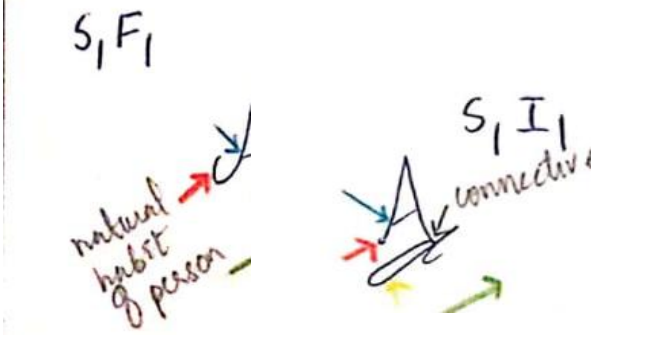
- a. To establish specific individual handwriting characteristics of an individual through their signatures,
- b. To determine and compare the similarities between full signatures and initial signatures of a particular individual, and
- c. To perform the identification of the individual on the basis of initial signatures only. A total of 150 signature samples from 50 different adult male individuals were collected randomly at Amity University Dubai. The subjects were asked to provide the request specimen signature of three complete (full signature) and three initial signatures on an A4 size paper with the help of a ballpoint pen. The collected samples were then studied for various characteristic features like the formation of the letter, initial and ending strokes, writing alignment, connecting strokes; pen pauses, pen lifts, and any flourishment if present. The samples were analyzed using a magnifying glass (10 x) and stereomicroscope under 50X for further enlargement to observe the minute details. The comparison of the class and individual characteristics were made manually using the identification parameters as described in "Handwriting Identification: Facts and Fundamentals" by Roy A. Huber & A.M Headrick [10].

III. OBSERVATIONS & RESULTS

As mentioned above, all the collected sample signatures (full and initial) were studied for the individual handwriting characteristic features. The characteristics have been identified and marked with different colored arrows (Figure 1 – 18). A careful comparative examination was made using magnifying glass and stereomicroscope to draw the

observation. To summarize the observations, few of the samples have been mentioned below as shown in Table 1.

Table 1: Representing selected samples and the comparison between the full and initial signatures of an individual

Sample Number Selected for Representation	Figures Description	Characteristics Comparison and Findings
Sample- 1	 <p>Figure 1: The format of the sample collected for sample no. 1 containing three full and three initial signatures.</p>  <p>Figure 2-3: Enlarged image comparison of the individual characteristics of the full signatures (marked as S1F1) with the initial signatures (marked as S1I1).</p>	<ol style="list-style-type: none"> 1. The initial stroke of Capital Letter 'A' is curved backwardly similar in both cases of complete signature and initial signature. 2. The middle arm of letter 'A' is starting proportionally at the same position in both the cases (full and initial signatures). 3. The Connective stroke of pen pause drawing is observed in both the cases and is individual to the writer. 4. The alignment in both the sets (full and initial) is ascending (upward). 5. There were specific pen lifts seen while drawing the bar of Capital Letter 'A' in both the cases

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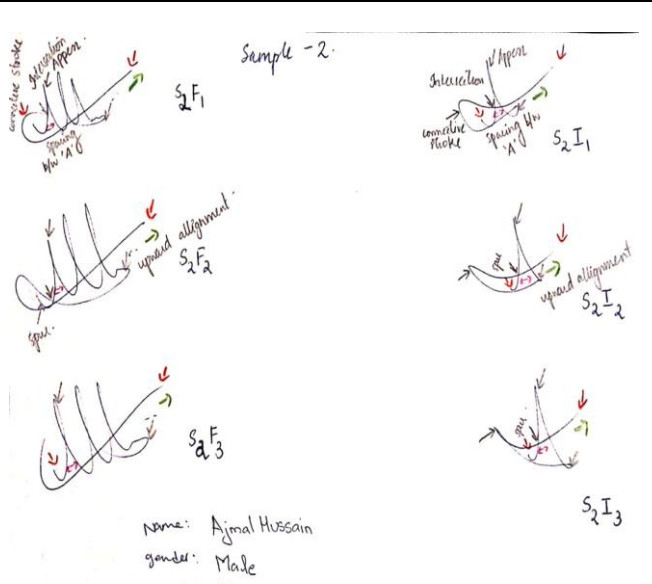
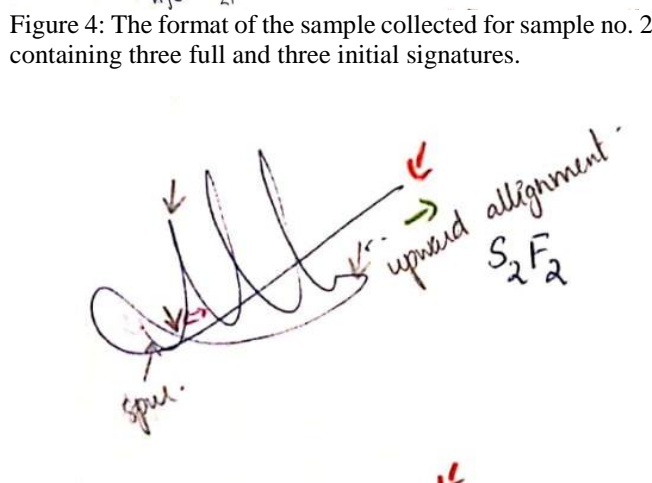
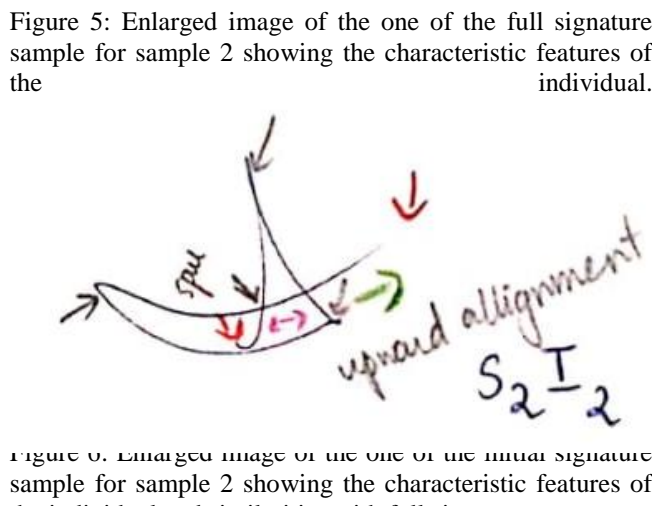
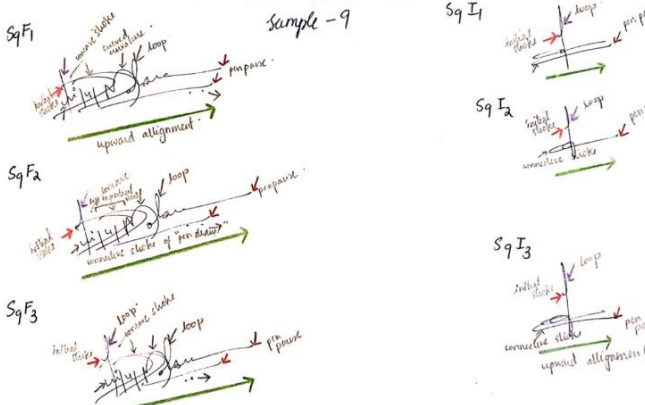
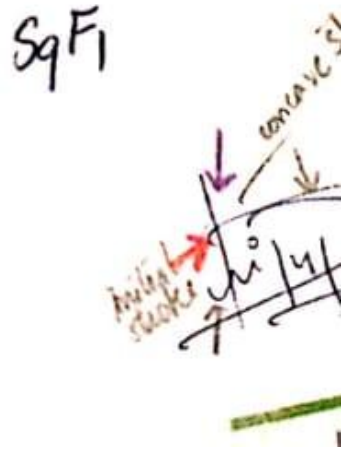
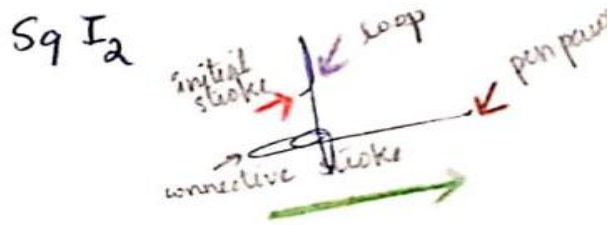
<p>Sample- 2</p>	 <p>Sample - 2.</p> <p>name: Ajmal Hussain gender: Male age: 21</p>	<ol style="list-style-type: none"> 1. The pointed, looped and shaded Apex of Capital Letter 'A' is a characteristic feature of the individual and is encountered in both the sets i.e. full as well as initial signatures. 2. The small projection spur of Capital Letter 'A' can also be observed in both the cases. (figure 5) 3. The Spacing between the two arms of Capital letter 'A' is proportionally similar in both the cases. 4. The alignment is upward and similar in both the cases. 5. The garlanded connecting stroke of is an individual habit and also similar in the case of full as well as initial signatures.
		
		

Figure 4: The format of the sample collected for sample no. 2 containing three full and three initial signatures.

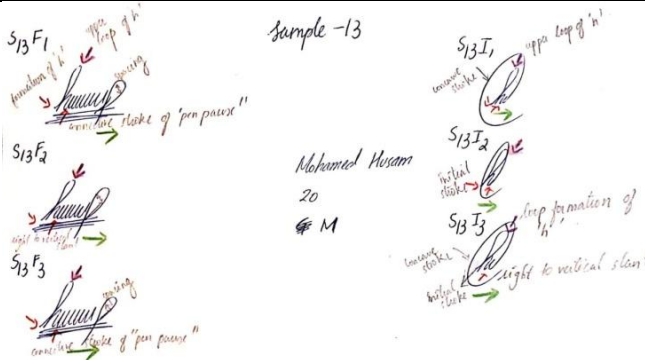

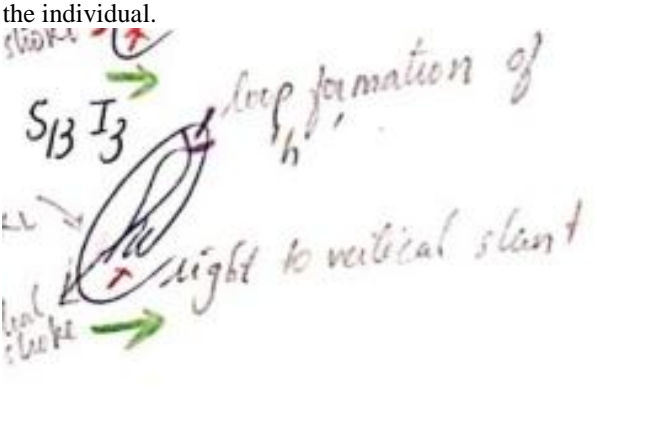
Figure 5: Enlarged image of the one of the full signature sample for sample 2 showing the characteristic features of the individual.

Figure 6: Enlarged image of the one of the initial signature sample for sample 2 showing the characteristic features of the individual and similarities with full signatures.

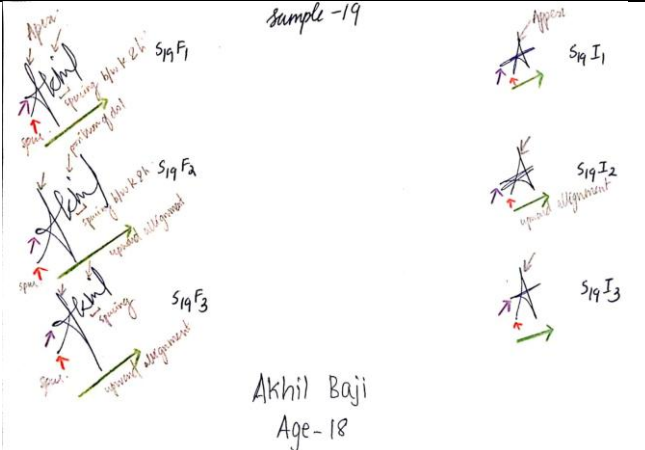
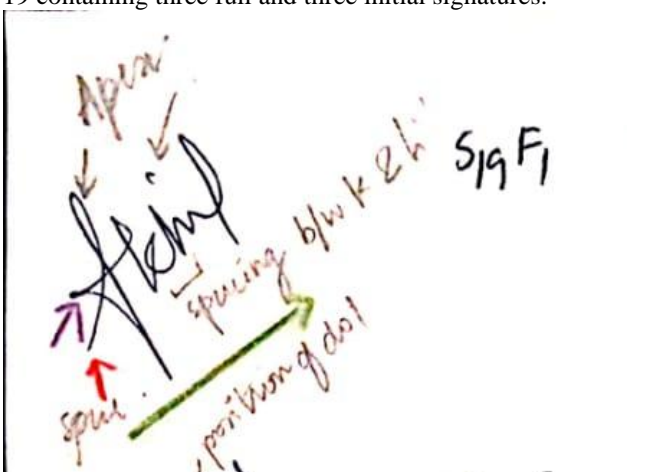

<p>Sample- 9</p>	 <p>Figure 7: The format of the sample collected for sample no. 9 containing three full and three initial signatures.</p>  <p>Figure 8: Enlarged image of the one of the full signature sample for sample 9 showing the characteristic features of the individual.</p>  <p>Figure 9: Enlarged image of the one of the initial signature sample for sample 9 showing the characteristic features of the individual and similarities with full signatures.</p>	<ol style="list-style-type: none"> 1. Initial Stroke of letter small letter 'f' is curved and is similar in both the complete signatures and initial signatures. 2. The upper loop formation is shaded made while writing smaller letter 'f' is also observed similar and can be his/her natural habit of writing. 3. The connective stroke of pen drawing seen in both the cases can be seen. 4. Pen pauses at the end of both complete and initial signatures are also observed from the figure. 5. The slant observed here is left to vertical slant in both the cases. 6. The alignment is going upward
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<p>Sample- 11</p>	<p align="center">sample-11</p> <p>Figure 10: The format of the sample collected for sample no. 11 containing three full and three initial signatures.</p> <p>Figure 11: Enlarged image of the one of the full signature sample for sample 11 showing the characteristic features of the individual.</p> <p>Figure 12: Enlarged image of the one of the initial signature sample for sample 11 showing the characteristic features of the individual and similarities with full signatures.</p>	<ol style="list-style-type: none"> 1. Upper half of the Capital letter 'S' is smaller than the below half of 'S' in both the complete and initial signatures. 2. Both the signatures are made in ascending and upward alignment. 3. Spine of 'S' drawn can be observed in similar curved manner. 4. Connective stroke of pen drawing is seen in both complete and initial signatures. 5. The habit of putting dot at the end of signature can be clearly seen in both the signatures. 6. The subject also has got the habit of pausing with pressure at the end of signature which deposits pen pauses at the end which is vividly seen in both the signatures which proves that both the signatures has been from the same individual.
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<p>Sample -13</p>	 <p>sample -13</p> <p>Mohamed Husam 20 M</p> <p>Figure 13: The format of the sample collected for sample no. 13 containing three full and three initial signatures.</p>  <p>Figure 14: Enlarged image of the one of the full signature sample for sample 13 showing the characteristic features of the individual.</p>  <p>Figure 15: Enlarged image of the one of the initial signature sample for sample 13 showing the characteristic features of the individual and similarities with full signatures.</p>	<ol style="list-style-type: none"> 1. Initial stroke of small letter 'h' can be observed in both the complete and initial signatures 2. The upper loop of small letter 'h' is also a habit of person seen in both the signatures. 3. Connective stroke of pen drawing can be observed in both the cases 4. The slant seen in both the cases are right to vertical slant which is a subconscious habit of the person.
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<p>Sample- 19</p>	<p>sample-19</p>  <p>Akhil Baji Age-18</p> <p>Figure 16: The format of the sample collected for sample no. 19 containing three full and three initial signatures.</p>  <p>Figure 17: Enlarged image of the one of the full signature sample for sample 19 showing the characteristic features of the individual.</p>  <p>Figure 18: Enlarged image of the one of the initial signature sample for sample 19 showing the characteristic features of the individual and similarities with full signatures.</p>	<ol style="list-style-type: none"> 1. The small projection Spur of Capital letter 'A' is seen in both the complete and initial signatures. 2. The pointed Apex of Capital letter 'A' can be observed in both the signatures. 3. Samples of both Complete and initial signature is going in an upward alignment 4. Pointed connective bar between the arms of Capital letter 'A' can be seen in both the types of signatures
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IV. DISCUSSION

Signatures are the personal identity of an individual. We all use our signatures every day several times for many official and ono-official purposes. Worldwide, many cases of signature forgeries are reported daily, and most of them encountered in financial transactions. Many times, people do proxy signatures for others [11]. Also, it has been noticed that most of the population uses two types of signatures i.e., full or complete signatures representing their names and initial signatures (short form) in their routine day to day affairs [12]. If such cases of initial signatures are disputed, then it becomes difficult for the forensic handwriting and signature analyst to compare these with full signatures and to reach any decisive conclusions. As a rule of analysis like has to be compared with like, in such cases initials should be compared with initials and full signatures should be compared with full [13] but problem arises when the full specimen signatures or admitted writing samples are not available, and the expert has to try to compare the full signatures with initials. The scope of present work was to study the minute individual similarities among the full and initial signatures of the individuals to aid in the identification of the author of the signature. In the study, it was observed that certain characteristic features of handwriting are repeatedly the same in full as well as initial signatures. Characteristics like the formation of the initial letter, connecting writing strokes, spurs, curves, the formation of strange shaded and unshaded loops, proportional size of the letters in respect to others, base alignment, individual flourishes, and writing slant. All these features may serve in the inclusive identification of the author. However, this may be further difficult if the act of disguise has been inculcated deliberately [14].

V. CONCLUSION

Based on the study, it can be concluded that there exists a number of similarities between the complete and initial signatures of an individual. The similarities that can be commonly seen in both complete and initial signatures are alignment, speed, slant, specific natural habit of the person especially in the formation of individual letters, pen lifts and pen pause within certain words or letters, spacing between individual letters, dotting after signature, initial, final & connective strokes. The principle of handwriting identification states that no two signatures are written exactly alike is related to the concept that each writer has a natural range of variation. This has also been observed in the present study. However, with the careful examination of individual writing characteristics, it is possible to an extent to compare two different (full and initial) sets of signatures, if made by the same person. However, handwriting experts examine patterns in signatures to establish a range of variation of a writer; the pattern needs to be established in several comparison samples. It was also concluded that this work has got certain limitations and future scope of work as discussed. One of the basic limitations was that when the expert doesn't find his/her expertise in language from the exemplars collected then the expert finds it challenging to study the similarity between written characteristics of the complete and

initial signature. On the other hand, when the subject has used completely different writing characters in full and initial signature, it becomes difficult for the expert to find the similarity to prove or disprove the authenticity of signatures.

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Ms. Pooja Prakash, Student of Bachelors of Forensic Science at Amity University Dubai. She has undergone a number of training in the area of questioned document analysis and signature verification. She has also completed this project under the guidance of Dr. Bhoopesh Kumar Sharma.



Ms. Sharon Ann Philip, Masters in Forensic Science from University of Kent, UK. Working as Forensic Instructor at Amity University Dubai and has been trained by Advanced Security Academy, Milan Italy. Also undergone in training to operate various instruments such as Scanning Electron Microscope, Nuclear Magnetic Resonance, X-ray Diffraction, X-ray Fluorescence, Spectroscopy from University of Kent, UK.