

Spectral Studies on Original and Fake Rupees 1000 Denomination Notes

***Ajitesh Pal and Hemanta Kumar Pratihari**

*State Forensic Science Laboratory,
Agartala-799015, Tripura, India
Corresponding Author E-mail: ajiteshp@rediffmail.com

Abstract

Since introduction of high denomination of rupees 1000 currency note, the production and circulation of counterfeit notes have alarmingly increased and caused a frightening menace in the country [1-3]. Time to time the Reserve Bank of India (RBI) also use to develop awareness among the general public through electronic media to know various security features and essential points to distinguish the fake and genuine notes during transaction. There have been extensive studies made on fake rupees 1000 notes adopting traditional methods like visual, microscopic and instrumental studies [4]. The introduction of Hi-tech print has made it difficult to distinguish between fake and genuine. This paper deals with the spectral studies like absorption and infrared on the different selective areas of genuine and fake notes.

Keywords: Note banks; counterfeit; original versus fake discrimination; spectroscopy.

Introduction

Keeping in view of the market needs and other requirements the rupees 1000 denomination notes were printed in the recent past for the following reasons:

- Convenient for handling heavy transaction,
- Economical than printing several notes of lower denomination,
- Convenient to carry good amount of money accommodating in wallet,
- Requirement of higher denomination currency due to inflation and economic growth

In addition, the appetite for the big bill Rs.1000 and 500 is growing furiously and the growth in the value of bank notes outpaced that of volume, reflecting the compositional shift towards higher denomination bank notes, particularly 1000 and 500.

The number of Rs.1000 notes minted annually has grown nearly 9 fold from 115 million in 2000-2001 to 1008 million in 2009-2010 as known from the RBI report. The first note of Rs. 1000 denomination was introduced under the currency act 1861. Subsequently different series of Rs. 1000 denomination have been issued. Presently, the sixth series now under circulation came into existence on 9th October, 2000 through RBI. These notes were categorized as Mahatma Gandhi Series notes with multiple security features like: (i) Watermark, (ii) Security Thread, (iii) Multicolored Optical Fibers, (iv) See Through Register, (v) OVI (Optically Variable Ink) feature, (vi) Latent Image, (vii) Intaglio Printing, (viii) Micro Printing, (ix) Fluorescent Number Panel, (x) Braille Mark etc.

Conventionally currency notes are examined by look, feel and tilt during transaction among the common people. When the fake currencies are seized and sent for laboratory examination, the conventional tests through illuminating magnifying glass, microscope and instrumental studies are conducted to identify and establish the genuineness. In addition to the existing technique, a new approach like spectral studies have been made and results of the studies found to be helpful in distinguishing the genuine/fake from their spectral behavior.

Brief History of the Case

One day the police personnel while performing the law and order duty in connection with a local festival, received secret information about the movement of a young boy carrying a good amount of fake Indian currency notes. Acting on this information, the police personnel searched the suspected boy in the festival and could detect for further interrogation. The suspected boy was thoroughly searched and a good number of Rs. 1000 denomination notes were recovered from him. After the seizure of the notes, local UBI bank was contacted to know the genuineness of the notes. On visual examination of the notes having Hi-tech print, it was difficult to opine by the bank authority and suggested for further examination in forensic science laboratory. The case was registered U/S 489 (C) IPC and the exhibits were referred to the laboratory for forensic examination with the following questionnaire:

- Whether the seized notes are genuine or counterfeit?
- If forged, please specify the special characteristics of the notes that determine its fakeness.

Materials and Methods

On receipt of the currency notes, conventional feel, touch and tilt was observed along with the examination of different security features / essential points prescribed by reserve Bank of India. On examination, these currency notes by the above methods found to be counterfeit, but further efforts were made to conduct spectral studies to find out characteristic features if any. The absorption and IR studies were conducted on both of the genuine and fake notes.

The absorption spectral characteristics were investigated by Video Spectral Comparator (Model VSC-5000) and the transmission infrared spectra were recorded by a Perkin Elmer FTIR spectrometer.

The figures 1(a) to 1(d) show the close-up photographic view of the front and back sides of the genuine and fake 1000 rupees denomination notes respectively.



Figure 1(a): Close-up photographic view of the front side of genuine 1000 rupees denomination note.



Figure 1(b): Close-up photographic view of the back side of the genuine 1000 rupees denomination note



Figure 1(c): Close-up photographic view of the front side of the fake 1000 rupees denomination note



Figure 1(d): Close-up photographic view of the back side of the fake 1000 rupees denomination note

Results and Discussion

The quality of examination and opinion drawn in any case depends on more number of scientific methodologies adopted in the process of examination. In this study, in addition to conventional tests, the spectral studies have been made to add more conclusive opinion. The results found in the spectral studies are observed to be encouraging to distinguish the spectral behavior between genuine and fake notes. In addition, the spectral data is reproducible in the court of law to help prosecution.

The spectral studies on both genuine / fake are shown in the figures 2a to 2c and 3a to 3c and only three different areas were selected for the study to avoid huge spectral data. More areas could be analyzed if complexity arises.

The absorption spectra of the different areas from the original and fake Rs. 1000 denomination bank notes are shown in the figures 2(a) to 2(c). This spectral study clearly indicates that absorbance versus wavelength graphs shown to be different.

Figures 3(a) to 3(c) clearly show that the corresponding transmission infrared spectra of the original and fake banknotes are remarkably different.

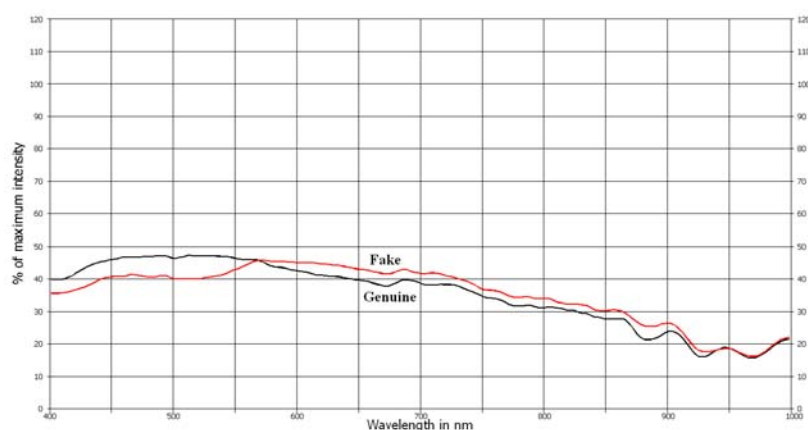


Figure 2 (a): Absorption spectra of the microlettering area from genuine and fake 1000 rupees denomination note.

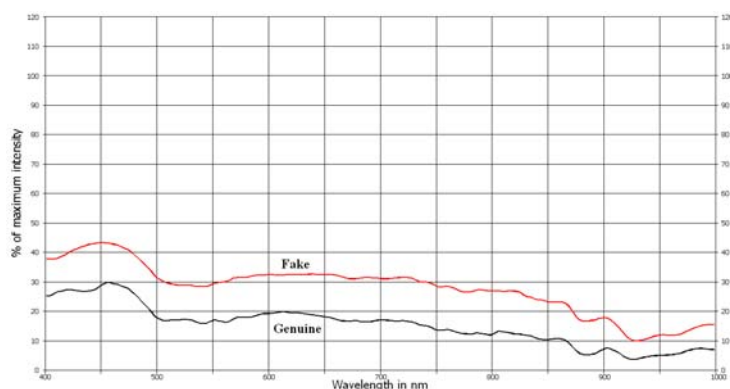


Figure 2(b): Absorption spectra of the center digit '1000' area from genuine and fake 1000 rupees denomination note.

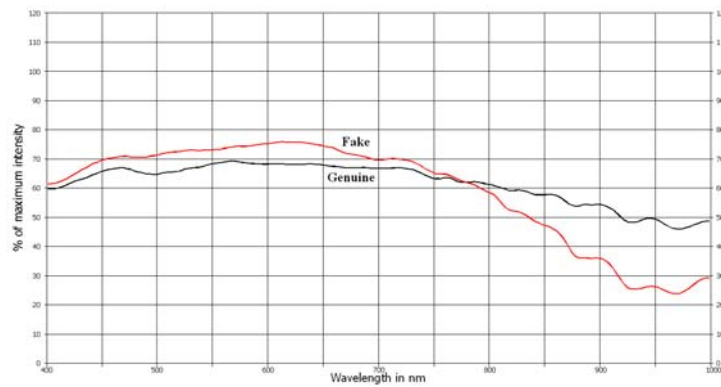


Figure 2(c): Absorption spectra of the watermark area from genuine and fake 1000 rupees denomination note.

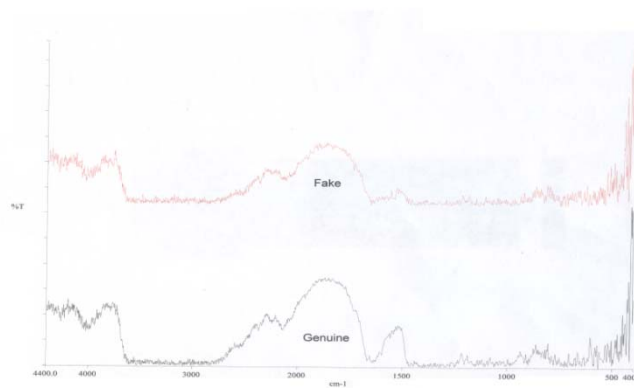


Figure 3(a): IR spectra of the micro lettering area from genuine and fake 1000 rupees denomination note.

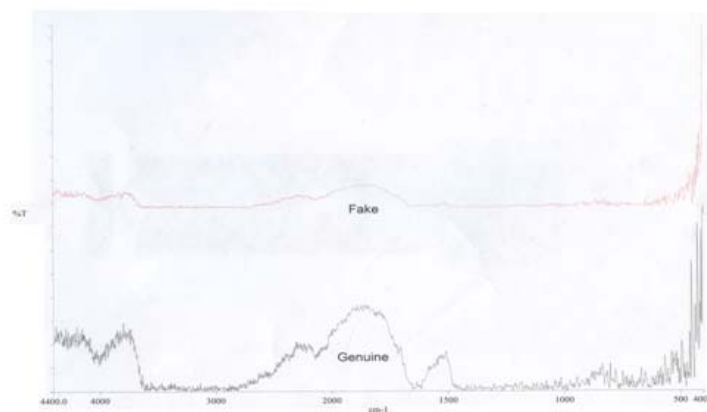


Figure 3(b): IR spectra of the center digit '1000' area from genuine and fake 1000 rupees denomination note.

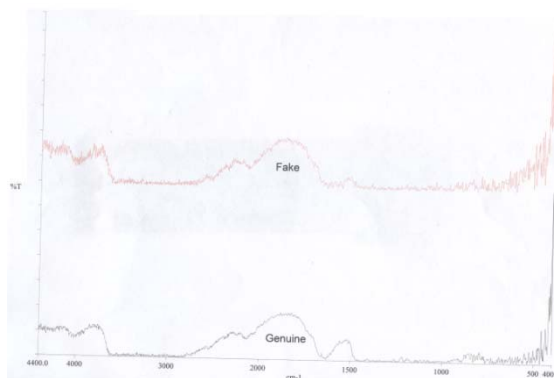


Figure 3(c): IR spectra of the watermark area from genuine and fake 1000 rupees denomination note.

Conclusions

The proposed procedure based on analysis of limited areas of bank notes using the absorption and infrared spectra, allows us to distinguish between genuine and fake Indian Rs. 1000 notes. The information obtained from each area is complementary for the discrimination purpose and can be extended by increasing the number of zones analyzed. The procedure is fast, non-destructive and suitable for forensic documents examination.

Acknowledgement

The authors are thankful to Dr. M.S. Rao, Ex-Chief Forensic Scientist, MHA, Govt. of India for his valuable suggestions.

References

- [1] Mittal, S. C., Arora, N. 2000, "Counterfeit Indian Currency", CBI Bulletin, VIII (11), pp. 8-15.
- [2] Mittal, S. C., Arora, N. 2003, "Forgery of rupees Five Hundred Denomination Notes-Methods of Detection", CBI Bulletin, II, pp.4-20.
- [3] Mittal, S. C. 2004, "Recent trends in forgery of Rs. 500 denomination Bank Notes of Mahatma Gandhi Series & their detection", CBI Bulletin, 12, pp. 8-24.
- [4] Mittal, S. C., Arora, N. 2005, "Recent Trends in the Counterfeiting of Rupees 1000 Denomination Currency Notes-Methods of Detection", NCRB Gazette, XVII (3), pp. 29-47.
- [5] Vila, A., Ferrer, N., Mantecon, J., Breton, D., Garcia, J.F., 2006, "Development of a fast and non-destructive procedure for characterizing and distinguishing original and fake euro notes," *Analytica Chimica Acta*, 559, pp.257-263.
- [6] Deb, S., Debnath, S., Pratihari, H.K., 2007, "Black Dollar-A Case Study," *Journal of the Indian Academy of forensic Sciences*, 41, pp.82-94.