

Security Printing and Raman Spectroscopy

In the realm of security printing, ensuring the authenticity and integrity of documents, particularly banknotes, passports, and identification cards, is of paramount importance. To achieve this, various levels of security features are incorporated into these documents. These features are designed to be easily identifiable by users, employable with common tools for verification, and even detectable by specialised sensors for advanced authentication. This document outlines the three levels of security features commonly employed in security printing.



Level 1: Visible Security Features

Level one security features can be readily identified by any user of the document or banknote with the naked eye. Features are often incorporated into the design of the document itself and serve as initial indicators of authenticity.



Watermarks
Images or patterns embedded into the paper during manufacturing, visible when held up to light



Security threads
Thin threads embedded within the paper, often with text or patterns, visible from both sides of the document



Holograms
3-dimensional images or patterns that change appearance when viewed from different angles



Guilloche patterns
Complex, intricate designs produced using precise mathematical algorithms, often found in background printing

➤ Level 1 serves as the first line of defense against counterfeiting, allowing users to quickly assess the authenticity of a document or banknote.



Level 2: Hidden Security Features

Level two security features are more sophisticated, require the use of common tools such as UV lamps or magnifying glasses for detection. These features provide additional layers of security and are not immediately visible to the naked eye.



UV fluorescence
Special inks or coatings that fluoresce under ultraviolet light, revealing hidden patterns or markings



Micro-optic elements
Extremely small images or structures that require magnification to observe



Microprinting
Tiny text or patterns that are not easily visible without magnification

➤ Level 2 adds complexity to the verification process, making it more difficult for counterfeiters to replicate authentic documents.



Level 3: Forensic Security Features

Level three security features are the most advanced and are intended to be detected by specialised sensors or equipment. These features are often referred to as forensic features and require sophisticated technology for verification. Usually a so called “taggant” is embedded in the document. Said taggant is any chemical or physical marker added to materials to allow various forms of testing. Physical taggants can take many different forms, and materials with specific spectroscopic properties are commonly employed.

One of the technologies utilised in level three security features is Raman spectroscopy. Raman spectroscopy involves shining a laser on the document and analysing the scattered light to determine its chemical composition.



Security Printing and Raman Spectroscopy

The present invention relates to the use of non-deactivatable security markers comprising the combination of at least two types of nanoparticles of materials presenting Raman effect, wherein said nanoparticles are in a dispersed state or is forming agglomerates of between 2 and 500 nanoparticles. The invention also relates to security documents, articles or elements incorporating these markers, as well as to a method and system for the detection thereof.



Find out more about the patent:

Use of Raman Markers for Authenticating Security Documents



PATENTED

Patent number: EP 2 714 419 B1



In the context of security printing, Raman spectroscopy can be employed to verify the authenticity of documents by detecting specific molecular signatures present in genuine materials.



However, to utilise Raman spectroscopy effectively, a suitable sensor with harmonised detection of the signal is required. This sensor must be capable of accurately capturing and analysing the Raman spectra emitted by the document.



By incorporating level three security features such as Raman spectroscopy into security printing, document issuers can enhance the overall security of their products, making them even more resistant to counterfeiting attempts.



Conclusion

Security printing relies on a combination of visible, hidden, and forensic security features to safeguard documents against counterfeiting. While level one features are easily identifiable by users, level two features require additional tools for detection, and level three features rely on advanced technologies like Raman spectroscopy for authentication.

By implementing these multi-layered security measures, document issuers can effectively combat counterfeiting and ensure the integrity of their products.

CHARISMA's contribution

The harmonisation of Raman spectroscopy is crucial for the effective application of this technique in industrial processes.

The CHARISMA project aims to accelerate this harmonisation and supports its implementation with guidance that takes into account the necessary steps.

