

Secret agent in the secret service: Utilization of Sb(III)-based complexes' emission properties for the study of forgery and document authenticity

Autorzy

Magdalena Rok
Aleksandra Krupińska
Marta Gordel-Wójcik
Przemysław Szklarz
Przemysław Starynowicz
Piotr Durlak
Rafał Janicki
Magdalena Malik
Ryszard Jakubas
Grażyna Bator
Anna Piecha-Bisiorek

Rok wydania

2025

Czasopismo

Journal of Materials
Chemistry C

Numer woluminu

13

Strony

17241-17250

DOI

10.1039/d5tc01333j

Kolekcja

Naukowa

Streszczenie

Document forgery, information leaks, and falsifying artworks, certificates, and diplomas have become increasingly sophisticated and challenging to detect. Therefore, designing materials whose response to external stimuli can be a perfect detector of crimes such as artifact forgery is crucial. Consequently, we decided to synthesize a functional material that exhibits strong broadband orange emission when exposed to UV light. This material is derived from organic–inorganic hybrids with the acronym **D4SB** (D4-dibutylammonium cation, Sb(III), B-ligand bromide). The **D4SB** crystal with stoichiometry $(D4)_3[SbBr_6]$ undergoes one phase transformation at 166 K (heating cycle) in the solid state. A characteristic and unique property is that the phase transition (PT) changes the emission color to yellow in the low-temperature phase. Returning to the high-temperature phase reverses the light emission back to orange. According to the detailed spectroscopic characterization supported by the theoretical calculations, broadband light emission is associated with self-trapping excitons (STEs), resulting from a strong interaction between an electron and a phonon of the crystal lattice. Another advantage of this crystal is the easy mechanochemical synthesis in the solid, which speeds up the chemical reaction and requires no additional chemical solvents, making the synthesis environmentally friendly. We use this property to create the samples as thin films, which were initially used to confirm the authenticity of artifacts.

Język

Angielski

Typ publikacji

Artykuł

Licencja otwartego dostępu

CC-BY

Licencja na prawach której można swobodnie kopiować, rozprowadzać, zmieniać i remiksować objęty prawem autorskim utwór (Utwór-przedmiot prawa autorskiego) pod warunkiem podania imienia i nazwiska autora utworu pierwotnego oraz źródła pochodzenia utworu.

Pełny tekst licencji:

<https://creativecommons.org/licenses/by/3.0/pl/legalcode>

Adres publiczny

<http://dx.doi.org/10.1039/d5tc01333j>

Strona internetowa wydawcy

<https://www.rsc.org/>