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Analysis of Prussian Blue analogues by Raman Spectroscopy

Prussian blue (PB) is the classic example of a mixed-valence $\text{Fe}^{\text{II}}-\text{Fe}^{\text{III}}$ hexacyanoferrate complex that was discovered in the early 18th century [1]. When Fe^{II} is replaced by another transition metal a Prussian Blue Analogue (PBA) is obtained. However, the mechanisms of formation of PBAs are not yet fully understood. For deeper analysis of PBAs Raman spectroscopy has emerged as a valuable tool. This is due to the fact that the wavenumber of the vibrational stretching mode of CN- ligands between 2150 and 2160 cm^{-1} depends upon the oxidation state of Fe [2,3]. In this study PBA films containing Co and Ni were prepared by potentiostatic electrodeposition on a gold substrate at 0.3 V until achieving a deposited charge of 50 mC . The chemical of these PBA films were analysed by Raman Spectroscopy. The measurements were performed with a 532 nm laser at 0.4 mW as shown in Figure 1. A mixture of Fe oxidation states was identified for both PBAs. Based on these findings, it can be concluded that these PBAs can be described as a mixture between PB and its reduced form, Prussian White (PW).

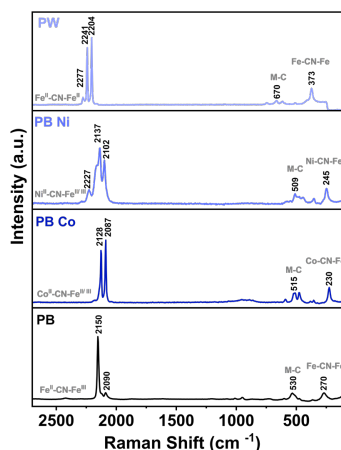


Figure 1: Raman spectra for PB, PB Co, PB Ni and PW thin films electrodeposited on Si/Au substrate

References

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