

Impact of copper ions and aqueous cations on eumelanin properties: insights from infrared spectroscopy

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Abstract

Melanins are promising natural materials for applications in bioelectronics. Recent works have demonstrated their usage as OECTs, pH, and humidity sensors [1], [2]. Properties of synthetic eumelanins are highly dependent on water content and d-elements similar to processes in nature. In the present work, we studied synthetic DOPA eumelanin compared to the one chelated with Cu²⁺ ions by means of medium infrared spectroscopy in conditions with control of sorbed water content. We found that copper ions slow down the processes of inner hydration of eumelanin monomers involving water molecules in the coordination sphere. Thus, they shift the equilibrium of a comproportionation reaction towards forming semiquinone radicals. Also, we demonstrate that these ions tend to decrease the contribution of some signatures of aqueous proton cations.

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Bibliography

[1] Mostert, A. B. et al. *J. Mater. Chem. B* (2020) doi:10.1039/D0TB01390K.

[2] Tehrani, Z. et al. *2d Mater.* 7, 024008 (2020).