

# Analysis of supramolecular melanin-material interactions for fundamental biology & applied biotechnological applications

Hanaa A. Galeb,<sup>a,b,\*</sup> Adam M. Taylor,<sup>c</sup> John G. Hardy,<sup>a,d</sup>

<sup>a</sup> Department of Chemistry, Lancaster University, Lancaster LA1 4YB, UK

<sup>b</sup> Department of Chemistry, Science and Arts College, Rabigh Campus King Abdulaziz University, KSA

<sup>c</sup> Lancaster Medical School, Lancaster University, Lancaster LA1 4YW, UK

<sup>d</sup> Materials Science Institute Lancaster University, Lancaster LA1 4YB, UK

\*[h.galeb@lancaster.ac.uk](mailto:h.galeb@lancaster.ac.uk)

## Abstract

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Alkaptonuria is a medical condition where patients have elevated levels of homogentisic acid (HGA) and its derivatives in their bodies which leads to the deposition of pyomelanin nanoparticle pigmentation in specific bodily tissues. The focus of this study is supramolecular melanin-material interactions, and in this study we report the analysis of polymerised HGA (polyHGA) nanoparticles formed under various conditions in vitro and ex vivo, with a view to understanding their biomedical relevance. A variety of spectroscopic and microscopic techniques were employed to analyse pyomelanin nanoparticle formation in vitro, 1) in the absence/presence of different enzymes, 2) in the absence/presence of extracellular matrix components, 3) in the absence/presence of cells, and 4) in vivo using a turkey tendon model. Analytical techniques employed to study these materials include: UV-Vis, FTIR, SEM-EDX, NMR, EPR, zeta potential measurements, XPS/XRD; and the electrochemical properties of these materials were assessed via CV, cAFM and SECM. The data offers insight into the pigment formation and its relevance to deposition in vivo, which offers molecular level understanding of potential clinical relevance; moreover, such insights may also be used in the design and development of novel materials for electronics and other biotechnological applications.

## References

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