

Technological development of melanin-based structural color materials for cosmetic applications

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Melanin plays a vital role in structural coloration in nature. Recently, we have focused on using polydopamine, a melanin-like polymer, to produce structural color materials. The purpose of this study was to develop melanin-based structural color materials for cosmetic applications. Using artificial melanin particles, we developed crack-free structural color materials, simple synthesis of structural color films, and techniques for obtaining uniform structural color films over large areas. A water/ethanol mixture was used as a particle dispersant to relax internal stresses in the particles that cause cracking. We found that the addition of non-volatile ionic liquids is effective in maintaining particle-particle interactions after solvent drying. We have also established a simple method for producing flexible structural color films by hot-pressing freeze-dried particle aggregations of melanin particles coated on the surface with a polymer with a low glass transition temperature. Furthermore, a large-area, uniform structural color film composed of melanin particles was created by utilizing a dip-coating method. These resulting structural color materials may be useful for use in nail polish and cosmetic seals. Since polydopamine is a material that mimics melanin, which exists in the body in both composition and structure, it is considered to be highly biocompatible and is expected to be developed in a variety of fields, including cosmetics.