Nanotechnology Used for Hair Strength and Color

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Background

Hair coloring is a widely practiced **cosmetic procedure**, yet most dyes rely on **synthetic chemicals** that cause **fading and hair damage**. These conventional products require **frequent reapplication**, leading to **weakened hair follicles and structural degradation**. A **sustainable, natural alternative** is needed to provide **long-lasting color while preserving hair health**.

Solution

This invention introduces a **novel natural nanoparticle-based hair dye** that enhances **hair color longevity** and **improves hair strength**. Unlike **chemical-based dyes**, this innovative formulation **encapsulates melanin and keratin derivatives** within **biodegradable carriers (PLGA, PEG-PLA)**, ensuring **deeper color penetration** and **reduced hair damage**.

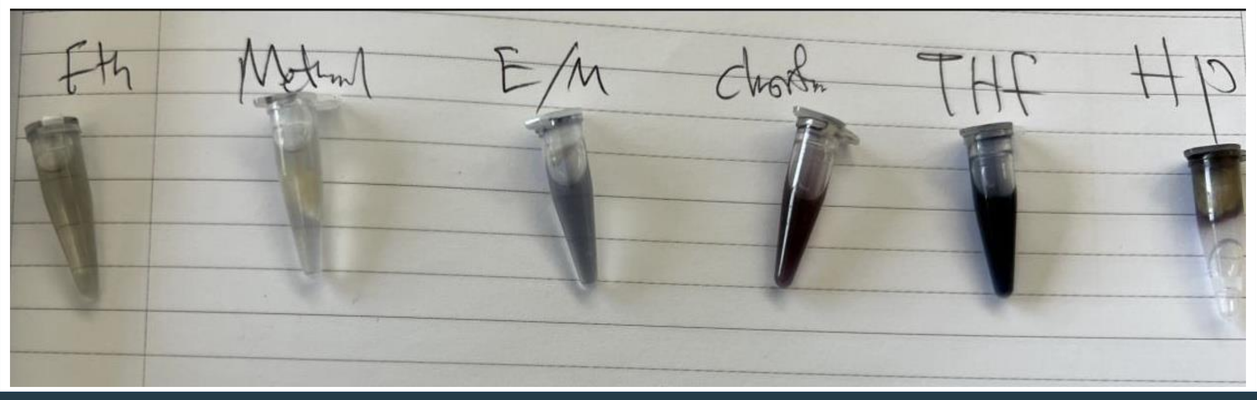
Key Benefits

- **Improved Hair Structure** – **Melanin and keratin derivatives** strengthen the **hair shaft**, preventing damage and promoting healthier hair.
- **Natural & Biodegradable Components** – The formulation uses **biodegradable and harmless materials** (PLGA, PEG-PLA), making it a **safer** alternative to **synthetic chemical dyes**.
- **Less Chemical Exposure** – Unlike conventional dyes that contain **harsh chemicals**, this invention **minimizes damage** and **preserves hair follicle health**.
- **Enhanced Sustainability** – Replaces traditional **chemical-based** hair dyes with **a natural and eco-friendly solution**.
- **Single-Use, Efficient Application** – Designed for **easy application**, delivering **deep penetration** into the hair follicle for **better absorption and lasting effect**.

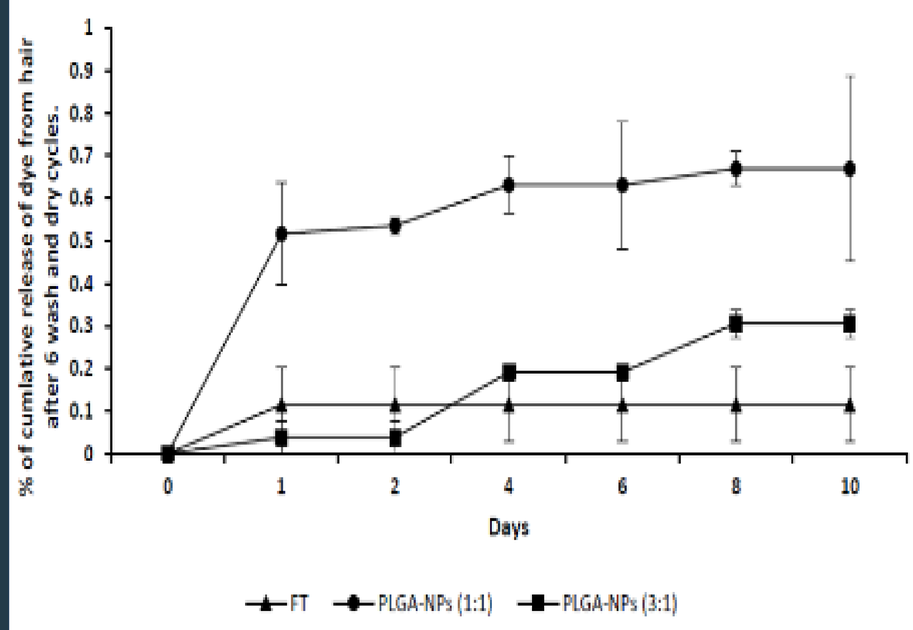
Methodology

The hair dye formulation consists of:

- ✓ **Melanin and keratin derivatives** (such as **impolavin, pheomelanin, toluene-5,2-diamine sulfate**).
- ✓ **Encapsulation within biodegradable carriers** (**PLGA and PEG-PLA**) for **enhanced absorption**.
- ✓ **Deep penetration into the hair shaft**, ensuring **stronger color retention** and **improved hair structure**.



Applications



Conclusion

This **nanotechnology-based hair dye** offers a **breakthrough solution** to the limitations of conventional hair coloring methods. By leveraging **biodegradable nanoparticles** to deliver **melanin and keratin derivatives**, the invention ensures **long-lasting color retention** while **strengthening and nourishing hair follicles**. Unlike traditional dyes that **fade quickly and cause structural damage**, this innovative formula provides a **sustainable, natural, and hair-friendly alternative**.
This advancement in **cosmetic science** has the potential to **revolutionize the hair dye industry**, catering to the increasing demand for **safer, more effective, and eco-friendly hair care solutions**.

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