



# Synthesis of Anti-Radiation Melanin Nanoparticles

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## Introduction

Melanin, an organic dark pigment naturally produced in most mammals, is known to shield cells from radiation damage by absorbing UV rays. The IGNITE project's aim is to fabricate a novel radiation-blocking material made of synthetic melanin nanoparticles (MNP).

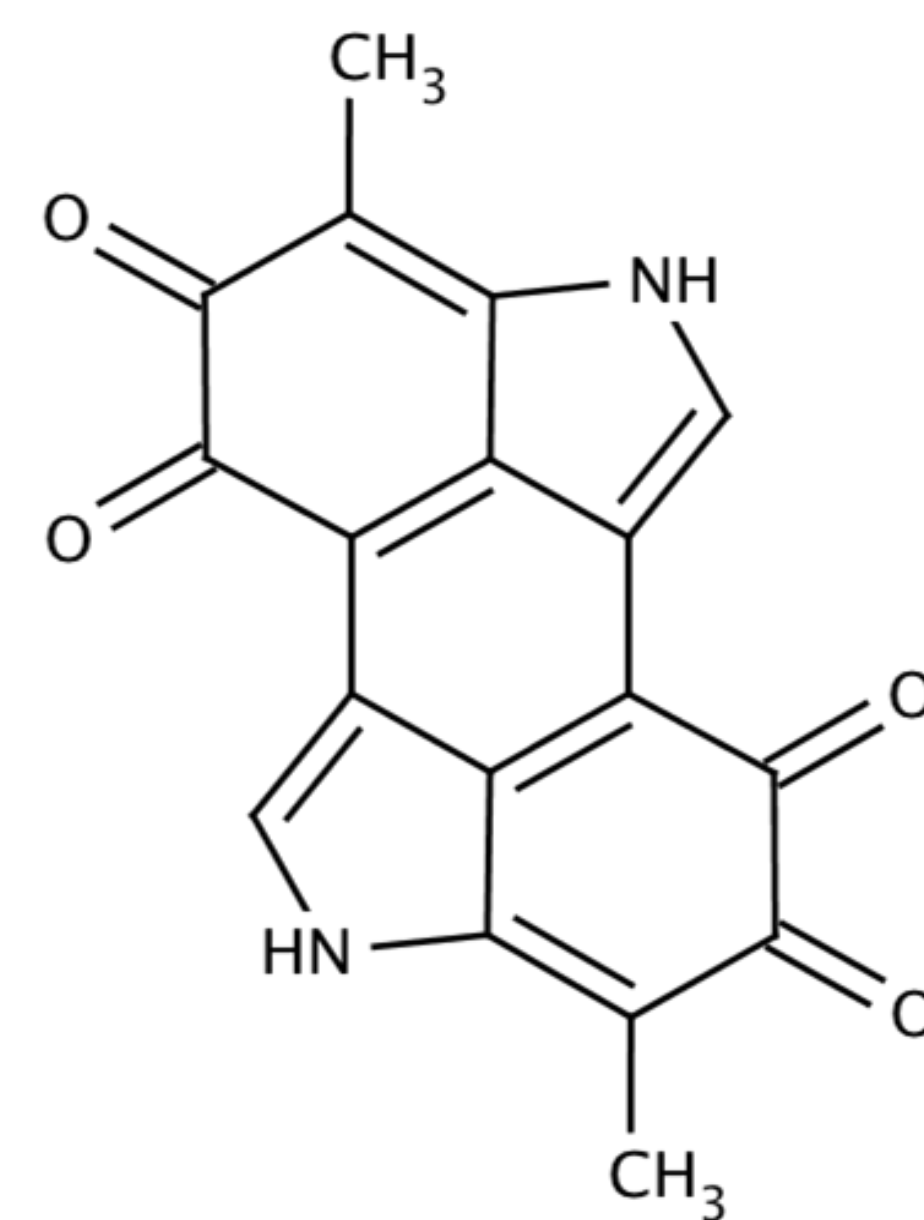


Fig: 1 Chemical structure of melanin

- Organic compound with anti-radiation properties
- Affordable to fabricate

## Results



Fig 3: Experimental setup of MNP synthesis with different ratios of dopamine hydrochloride and sodium hydroxide in oil bath. The change in concentration of the dopamine hydrochloride and sodium hydroxide 1:1, 1:2, 1:4 ratios is being studied. A change in color from clear (beginning of reaction) to black (end of the reaction, 3 hours) was observed.

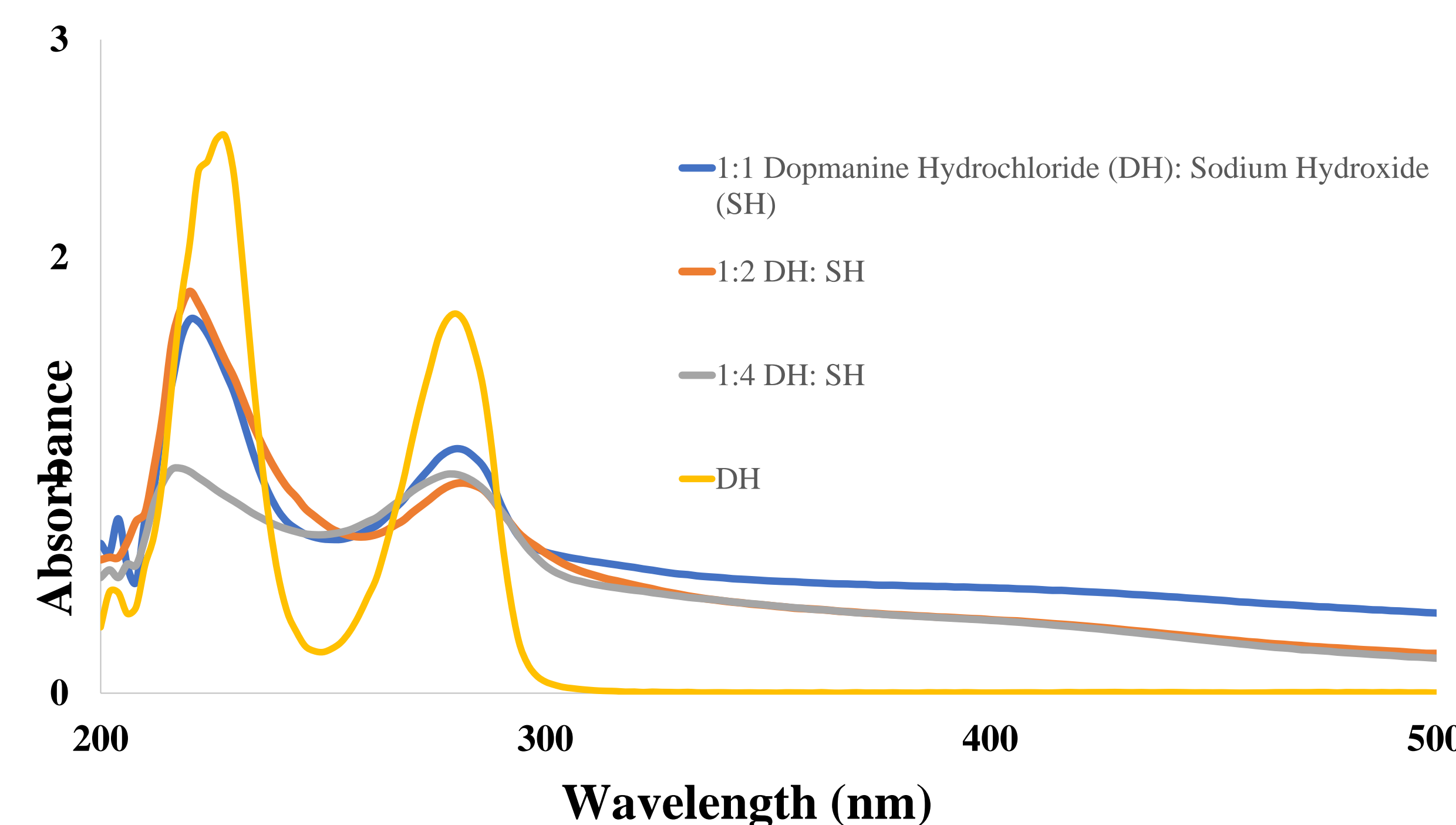


Fig 4: UV-spectrophotometric analysis of the different ratios of Dopamine Hydrochloride and Sodium Hydroxide solutions. Water was used as a blank solution and Dopamine Hydrochloride was used as a comparison solution. The reaction (3 hours) was observed.

## Future Applications

- Electrospray of MNPs onto glass slides to produce thin-layer of nanoparticles

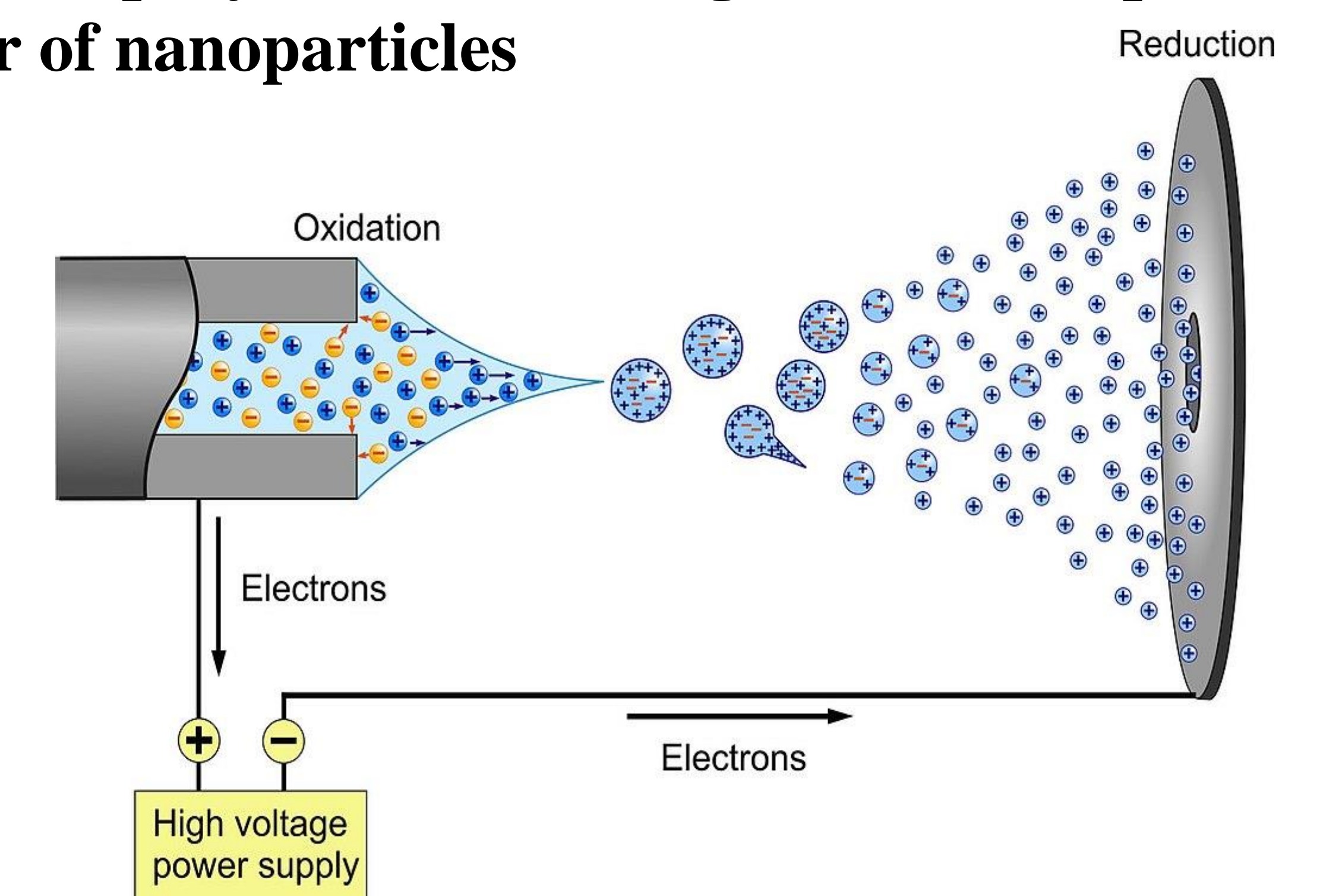


Fig 5: Schematic image of Electrospray Mechanism

## Materials and Methods

MNPs will be synthesized using three methods

- Method 1: Melanin synthesis in basic solution
- Method 2: PEG-based
- Method 3: Chitosan-based

Currently, melanin synthesis is being conducted using Method 1 with pH and temperatures as variables.

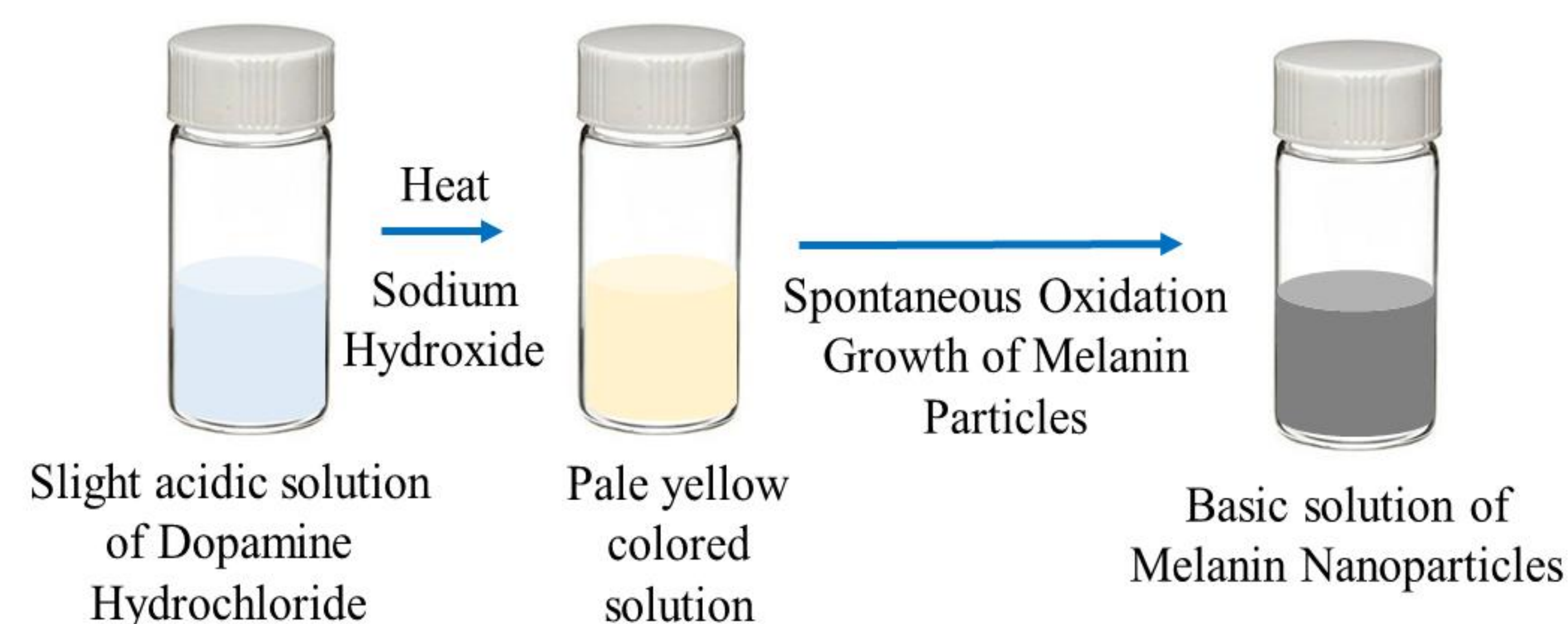


Fig 2: Schematic image of the experimental procedure for the synthesis of Melanin nanoparticles using Dopamine Hydrochloride and Sodium Hydroxide.

## Future Characterization Methods of Nanoparticles

- FTIR analysis of samples to identify functional groups
- Zeta Potential measurements to identify surface charge
- Transmission electron microscope to measure the diameter and distribution of the particles
- Scanning electron microscope images with Energy Dispersive X-Ray Spectroscopy to identify the element
- Electrospray on flat substrates
- UV radiation blocking tests

## References

[1] Cho, Soojeong; Kim, Shin-Hyun (2015). Hydroxide ion-mediated synthesis of monodisperse dopamine-melanin nanospheres. *Journal of Colloid and Interface Science*, 458(), 87-93. doi:10.1016/j.jcis.2015.06.051

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