

Overview of the Surface Adsorption of Common Dyestuffs Used in the Textile Industry onto Granulated “Green” Materials

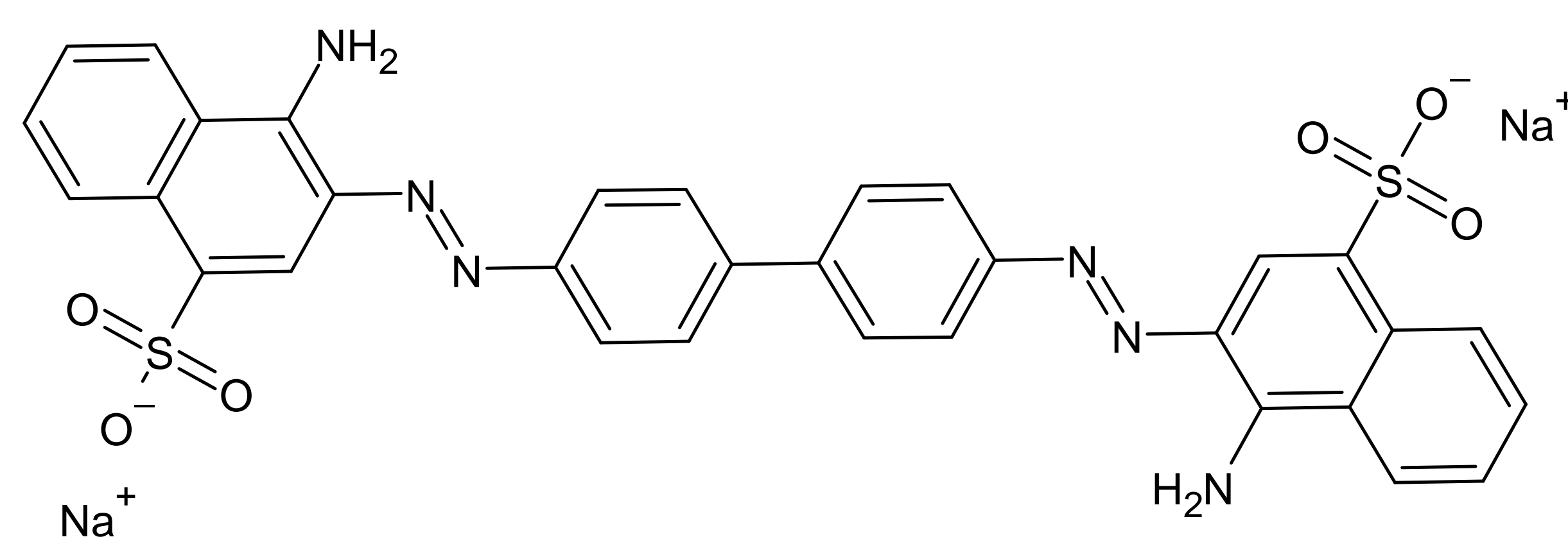
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Abstract

The contamination of water sources via the release of chemical dyestuffs used in textile manufacturing has become a source of concern for environmental scientists in recent years. Furthermore, the accumulation of heavy metals and organic compounds used in the dyeing process present adverse effects towards natural biodiversity (plant, aquatic, and marine life), as well as negative effects on human health. Attempts to remediate and further prevent these contaminants from polluting public waterways using adsorption-based removal processes are currently in place. However, those processes typically use expensive and/or ecologically unfriendly settings. Thus, the search for “greener” adsorbents, such as crushed eggshells, is of paramount importance.

Overview

Congo Red, C.R., is one of the most common synthetic azo dyes currently used in the textile industry; the structure of this dye makes it particularly carcinogenic and challenging to remove via traditional methods [1]. Due to the prevalence of this dye in wastewater, it is imperative to find alternative methods for removal. Studies have shown that it possible to remove these azo dyes using adsorption via organic membranes [2].

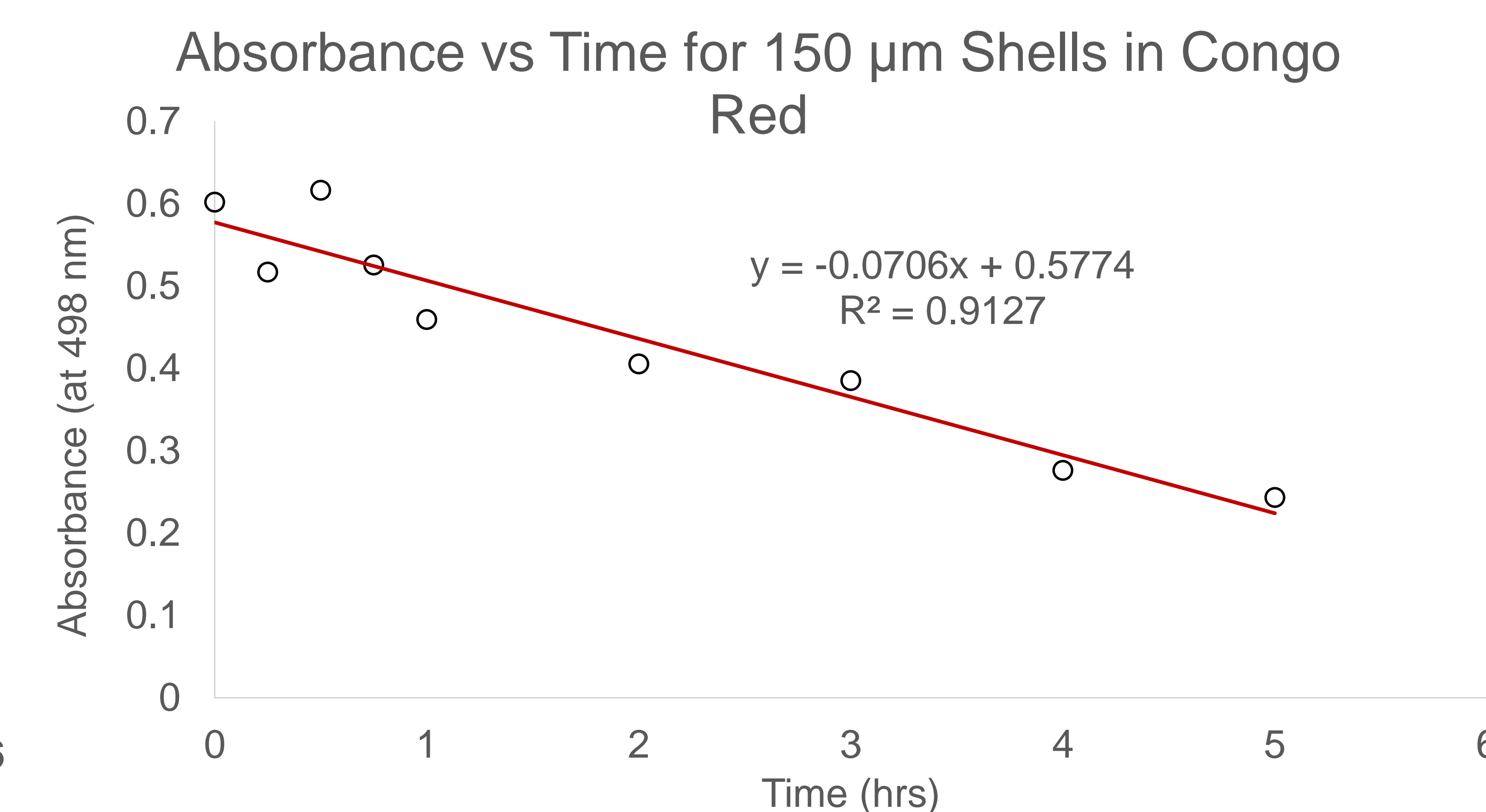
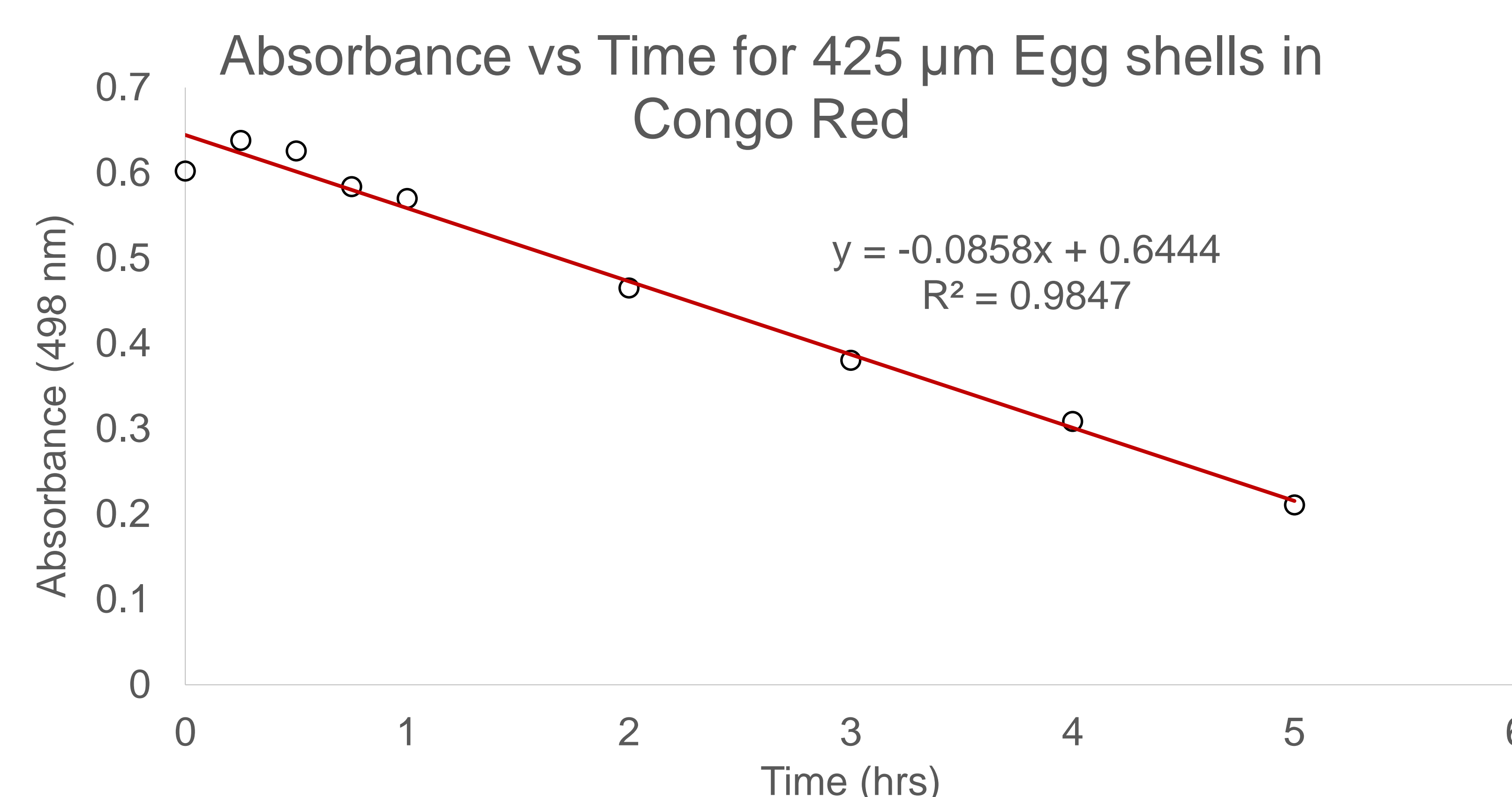


Methods and Materials

Eggshells were crushed to desired testing diameters using a mortar and pestle as well as a sieve. A stock solution (1,000 ppm) of C.R. was made with no pH standardizations. Serial dilutions of a 1:10 ratio (see photo) were done to form a calibration curve using UV-Vis absorption spectroscopy. For C.R. experimentation, a 10-ppm solution was used to determine efficiency of size of crushed eggshell for maximum adsorption. Aliquots were taken and analyzed under UV-Vis with wavelength of 498 nm.

Results and Discussion

This analyses indicate That the smaller the particle size, the faster the solution was removed of the CR dye, as represented by the absorption values from the UV-Vis. The lower the absorption value, the more dye was removed by the eggshells with respect to time.



This experiment shows that CR can be removed from water using crushed eggshells of particle sizes near 425 µm. This is the first step to develop a dye removal filter using crushed eggshells as the adsorbent component.

References

[1] Asses, N.; Ayed, L.; Hkiri, N.; Hamdi, M. Congo Red Decolorization and Detoxification by *Aspergillus Niger*: Removal Mechanisms and Dye Degradation Pathway. *BioMed Research International* **2018**, 2018, 1-9.

[2] Sun, G.; Xu, X. Sunflower Stalks as Adsorbents for Color Removal from Textile Wastewater. *Industrial & Chemical Engineering Research* **1997**, 36 (3), 808-812.

Acknowledgements

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