pH-Dependent Colorimetric Assays for Biomarking Amino Acids

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This project explored the synthesis of gold nanoparticles from chloroauric acid, mediated through the reducing abilities of selected amino acids. Given that amino acids have been identified as biomarkers for a variety of disorders and diseases this colour-change reaction has applications in lab-on-a-chip chemical assays used in medicine. Experimentation demonstrated that the synthesis of gold nanoparticles is effective in the identification of phenylalanine. However, little research has investigated methods of modifying this colour change protocol to develop diagnostic tests for other amino acids. This research identified the effects of salt on the colour change reaction, the influence of pH on nanoparticle synthesis and aggregation, and the viability of solid mediums for housing the reaction. Chloroauric acid reduction and the resulting nanoparticle synthesis is time dependent, and the colour change produced is dependent on the biomarker present. Visible colour variability also shown with varying the pH of a solution allowed for easy manipulation and modifiability of nanoparticle synthesis and aggregation. Potential correlations between pH and pI provide a promising avenue for future work, and the moderate success of a trialed solid medium indicates promising applications to solid mediums. Potential diseases this protocol could be applied to include gastroesophageal cancer, Alzheimer’s Disease, lung cancer, and other metabolic disorders. This work provides a foundation for future optimization of chloroauric acid reduction as a method of identifying the presence of various biomarkers, and potentially developing rapid, inexpensive, and easily-producible platforms for disease detection.

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