IDENTIFICATION OF THE ARTIFICIAL SYNTHESIS OF AROMATIC AMINO ACID TYROSINE, BASED ON Π Π* ABSORBANCE PEAKS

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Project ID#

Q1: Research Question/Engineering Goal

Can one or more amino acids be synthesized by exposing clay to common chemicals and heat, and subsequently be identified to a high statistical correlation and confidence?

This science fair project scrutinized the creation of amino acids by using clay as a catalyst, when heated with common chemicals and water. The goal was to create a "building block" amino acid, one that could possibly be used to synthesize proteins in the future.

Q2: Methodology/Project Design

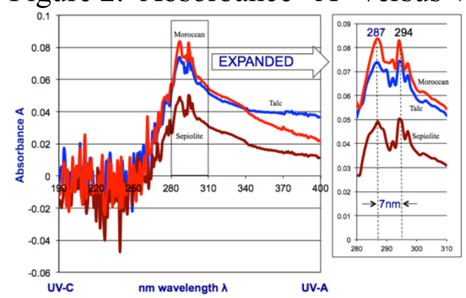
1. Gather all required materials and keep organized, making sure to avoid contamination.
2. Measure 0.400g of autoclaved clay specimen and place in a 16mL test tube.
3. Measure 3mL of Sodium Phosphate and add to 16mL test tube.
4. Repeat step 3 with Sodium Carbonate, Hydrogen Peroxide, and Ammonia Water.
5. Heat 250mL of water in a 400mL beaker until 100 degrees Celsius with a hot plate.
6. Seal test tube with clay specimen and $NaPO_4$, Na_2CO_3, H_2O_2, and $NH_3 + H_2O$.
7. Shake test tube vigorously for 10 seconds. Place test tube in hot water and subject to water bath.
8. Let mixture stay in bath for 20 minutes.
9. After 20 minutes pass, turn off hot plate and let specimen cool for 10 minutes.
10. Remove test tube and set-in test-tube rack. Remove seal.
11. "Blank" cuvette utilizing S2150UV spectrophotometer and K3 Analyst Software to create the signature of an empty cuvette for subtraction from the sample in the cuvette.
12. Take 3mL of clear liquid collected at the top of the test tube, and place in "blanked" cuvette.
13. Analyze utilizing S2150UV spectrophotometer and K3 Analyst Software.
14. Record absorbance "A" of each specimen against wavelength in nanometers.
15. Graph and analyze absorbance data versus wavelength.

Q3: Data Analysis & Results

Table 1. Application of Beer-Lambert Law A = εLC

Wavelength	λ1 (empirical) = 287nm	λ2 (empirical) = 294nm
Path Length L (S2150 cuvettes)	10 mm (1 cm)	10 mm (1 cm)
Absorbance A(Talc) Absorbance A(Moroccan)	0.0738 0.0837	0.0741 0.0828
Concentration of Tyrosine Talc versus Moroccan: C(Talc) / C(Moroccan)	0.0738 / 0.0837 = 88.2% (Average	0.0741 / 0.0828 = 89.5% = 88.8%)
Absorbance A(Sepiolite) Absorbance A(Moroccan)	0.0491 0.0837	0.0501 0.0828
Concentration of Tyrosine Sepiolite versus Moroccan: C(Sepiolite) / C(Moroccan)	0.0491 / 0.0837 = 58.7% (Average	0.0501 / 0.0828 = 60.5% = 59.6%)
Absorbance A(Sepiolite) Absorbance A(Talc)	0.0491 0.0738	0.0501 0.0741
Concentration of Tyrosine Sepiolite versus Talc: C(Sepiolite) / C(Talc)	0.0491 / 0.0738 = 66.5% (Average	0.0501 / 0.0741 = 67.6% = 67.0%)

Figure 2. Absorbance "A" versus Wavelength "λ" for Three Clays



I created a correlation matrix [R] between the three clays used to create Tyrosine and obtained pairwise cross-correlations between 94.2% and 97.7%, with a confidence level exceeding 99.95% in all pairwise cross-correlations.

Q4: Interpretation & Conclusions

My project showed that I was able to create and identify Tyrosine, an aromatic amino acid, using three different clays. One clay, Moroccan, was better at creating Tyrosine than Talc, and much better at creating Tyrosine than Sepiolite. I created a correlation matrix [R] between the three clays used to create Tyrosine and obtained pairwise cross-correlations between 94.2% and 97.7%, with a confidence level exceeding 99.95% in all pairwise cross-correlations. Thus, my hypothesis of creating at least one amino acid was accepted.