The Maya Blue pigment has been known for its distinct color and ability to resist degradation over centuries throughout the harsh climate of Mesoamerica[1]. However, these properties have yet to be fully explained due to the unique bond between the indigo and palygorskite structure[2]. Using the surface technique of X-Ray Photoelectron Spectroscopy (XPS), which was created consequent to the discovery of the Photoelectric effect, we hope to find information regarding the electronic structure that will be allow this phenomenon to be understood to a further extent.

The signal at 532.5 eV corresponds to the C=O bond, while the peak at 533.35 eV represents C-O bond from the Carbonyl group of indigs.

Using X-Ray Photoelectron Spectroscopy, three samples of the Maya Blue pigment were analyzed. Two of which were pressed into a solid surface, while the other was left in a powder and analyzed with carbon tape. It seems that the powder sample provided the best results, with the peaks being more obvious and normal to the previous samples.

From the pressed samples, calcium peaks were detected and were not expected, however they were not present in the powder sample, which could mean that there was contamination from being pressed.

In regards to the hypotheses that explain the stability of the pigment, we have not found enough evidence to believe that iron is contributing to the stability, since the results did not signal there was an iron oxide bond, nor any other iron peaks.

References

[1] López, J., Carbo, M., 
[2] Yacamán, Y., 

Methodology

By implementing the knowledge of the photoelectric effect, Kai Siegbahn, developed the surface technique known as X-Ray Photoelectron Spectroscopy, also known as Electron Spectroscopy for Chemical Analysis. The technique functions using incident X-Rays that bombard the surface of the material, releasing electrons from the surface.

E = hf - Φ - Ω

By measuring the kinetic energy of the ejected electrons and knowing the work function of the spectrometer, the binding energy can be calculated. Since binding energies are unique to each element and their orbital state, the electron configuration and elemental composition can be determined.

Conclusion

With XPS and XRF methods, it is possible to further analyze the surface of the Maya Blue pigment to determine the electronic structure, so that a conclusion regarding the hypotheses can be determined.