Lapis Lazuli

**Chemical Structure**

\[
\text{Lapis Lazuli: } (Na, Ca)_9 Al_{8} (SiO_{4})_6 (SO_{4})_2 (OH)_8
\]

**Ultramarine Sickness**

Dilute mineral acids (dilute HCl, HNO₃, or H₂SO₄) rapidly destroy the blue color with evolution of hydrogen sulfide gas:

\[
2\text{HCl} + \text{Lapis Lazuli} \rightarrow \text{CaCl}_2 + \text{H}_2\text{S} + \text{Lazurite}
\]

**Lapis Lazuli Quality**

The quality and grade of the lapis lazuli pigment has to do with the impurities in the lapis lazuli mineral. The main type of impurities found in lapis lazuli are calcium carbonate and calcite.

**Distinguishing Lapis Lazuli from other blues**

- **Heat Resistance**
  - The blue color of ultramarine remains unchanged, whereas azurite is converted to black copper oxide.
  - This distinguishes ultramarine from azurite.

- **Refraction**
  - Refractive index is too low for light to pass through the material.
  - The light of lazurite is lower than all other pigments at 1.5.
  - Different crystals bend light in different ways—affects how we see.

- **Polarized Light Microscopy**
  - When tested under polarized light, lazurite is a bit on the blue side of the spectrum.
  - Polarisated-light microscopy is used to study the structure of the pigment particles.

- **Can differentiate between different structures based on how they interact with the polarized light.

**Sebastiano del Piombo, The Daughters of Hercules or Salome, c. 1510. Oil on wood**

The drapery contains a layer of azurite (pale blue pigment) with lead white. On top of this is a thick glaze of ultramarine in the oil layer over a thin layer of ultramarine glaze. A layer of azurite is seen at the bottom layer.

- Pancioli’s use of oil as a medium in this piece shows a very convincing means of expressing the volume and quality of fabrics as well as a more effective way of modeling.
- Modeling is a technique where the painter shows shadow and light by watching colors as forming a totally different color when producing shadows/highlights.
- Differing from tempera where the binder is egg yolk, oil paint allows the pigments to show a degree of translucency.

**Lapis Lazuli Origins**

- Lapis Lazuli forms from the ancient quarries of Badakhshan (modern-day Afghanistan).
- Lapis Lazuli was used in the Sistine Chapel in 1967-9, tempera on wood.

**Cost**

- ‘More expensive than gold!’
  - The National Gallery, London

**Processing Lapis Lazuli**

- Here begins the practice of extracting the azure from the lapis lazuli. Take the stone, which is mineral, and freshly mixed in wet lime, heat it on burning charcoal, and afterwards extinguish it in good and very strong white ash. Choose the good pieces, and grind them fine in a brass mortar, when very finely ground put the powder into an earthen dish and pour over it hot water or hot lay with a little honey and clay, rubbing the azur with your hands or with a stick, in order to extract the azure. Afterwards strain it through a linen cloth in a well-placed earthenware basin, and pour off the water, or, if still better, the ley, leaving the powder of the lapis lazuli settled in the basin, wash the azure until the saline particles of the ley are washed away, and in the azure dry in the shade...

**Infrared photography of this image shows the damage to the silicate structure (SiO₂) but also because of the possibility of damage to the azurite structure (SO₄)₂ depending on how long it is in contact with the calcium hydroxide**

**Damage**

In The Virgin and Child with an Angel!

Natural ultramarine layers were used for the blue draperies in this painting. The high saturation of the blue attests to why it was a pigment of great adding to the fact that the most expensive pigment be used for the drapery of the Virgin. This image has suffered from the fact that lapis is a poor drier in oil. Although it is capable of being used as a glaze without lead white, it tends to crack without it. Lead white is often used with lapis in order to aid the drying process. The shadows are the most affected by this fault.

The ability of oil to produce convincing images of fabrics are exploited in this piece. Here, Salome’s satinsleeve is painted with zigzagging highlights of places of high quality ultramarine and lead white. This is an excellent example of the color ultramarine can produce. You can see the bluish violet color especially in the shadows.

**Cost**

- ‘More expensive than gold!’
  - The National Gallery, London

**The prices of the pigments of ultramarine and azurite depended on the quality of the raw materials and the way they were refined**

**Infrared photography of this image shows the abundance of pure ultramarine. Ultramarine reflects infrared light, meaning that it appears white under it. So wherever you see white where blue was once, it sauces the viewer that it is ultramarine. On the contrary, azurite/alabaster blue pigments absorb infrared light so it would appear a very dark gray color rather than white. This is a primary way of telling the difference between azurite and ultramarine.**