# Introduction

Watercolor paints are a transparent art medium that use gum arabic as their main binder. Pigment properties are readily apparent in watercolors due to the low pigments loads that give them their transparency. When selecting colors for opaque mediums (acrylics, oils, etc.), one usually only needs to consider the color or mixing potential. When selecting colors for a watercolor painting or palette, one must carefully consider what pigment properties will work best.

The four most important pigment properties to consider are:

* Lightfastness
* Transparency
* Staining
* Granulation

# Lightfastness

Lightfastness is how resistant a pigment is to fading with prolonged sunlight / UV light exposure. Pigments can be lightfast, fugitive, or somewhere in-between. Fugitive pigments are not lightfast and will fade or even disappear after enough sunlight exposure. Lightfastness is important for artists who are selling, gifting, or displaying their work. No one wants their painting to change colors after investing time and effort to create it.

Lightfastness ratings are not uniform between brands, which can be confusing. Let me illustrate using the Daniel Smith, QoR, and Schmincke brands as an example. Daniel Smith uses the ASTM (American Society for Testing and Materials) ratings I, II, III, and IV to denote lightfastness rating. QoR mainly uses ASTM ratings (I, II, III, and IV), and for any pigments unrated by the ASTM, QoR will do independent testing and assign their own rating (EX, GD, or FR). Schmincke has a star system representing the blue wool scale using 1-5 stars. For ASTM ratings, a “I” is excellent lightfastness. For QoR’s independent ratings, “EX” stands for excellent. For Schmincke’s star system, excellent lightfastness pigments have five stars.

Sometimes brands will use the current ASTM rating and forgo any of their own testing. For example, the recently released PO64 (Saturn Red) has an ASTM rating of I (excellent lightfastness), but when diluted in watercolor applications it “[starts to fade in as little as one month.](https://www.kimcrick.com/pages/fugitive-pigments-list-lightfast-test-problems-art-supplies#PO64)” The opposite is also possible, with some previously lower rated pigments such as PR122 (Quinacridone Magenta) having more lightfastness in [current tests](https://justpaint.org/qor-lightfastness-testing-update/). It’s recommended that artists do their own testing to ensure their paints are performing as intended.

# Transparency

Transparency is a property of watercolor paints that allows artists to layer colors via glazing techniques. It’s important to know how transparent or opaque a pigment is, and therefore, how much light will be able to penetrate the layer of paint you put down. Transparency typically ranges from:

1. Transparent
2. Semi-transparent
3. Semi-opaque
4. Opaque

Opaque pigments don’t let much light through and sometimes have a chalky texture. An example of an opaque pigment is PR108 (Cadmium Red). Transparent pigments allow the light to bounce back from the white of the paper, giving them a luminosity effect. An example of a transparent pigment is PO49 (Quinacridone Gold).

# Staining

Staining pigments are vibrant and hard (often impossible) to lift off paper, even when diluted. These pigments have smaller particles that allow the paint to sink into the paper fibers. If an artist uses a lot of lifting techniques, they will probably avoid pigments that are staining. An example of a staining pigment is PB15:3 (Phthalo Blue).

# Granulation

Granulation is the uneven clumping of pigment particles (granules). Pigments that granulate can add a lot of texture to a painting, as well as interesting patterns that separate out of color mixes. Granulating pigments can also flocculate. According to [Tegen Hager-Suart](https://www.jacksonsart.com/blog/2019/10/31/watercolour-granulation/), there is a difference between granulation and flocculation:

One theory, supported by chemists, states that granulation is the appearance of visible particles of pigment on paper due to the uneven depositing of the sediment, whereas flocculation is the mutual attraction of small particles of pigment into groups that creates patterns on the paper. This would make the two fundamentally different because of the process that causes them.

Pigments with heavier particles tend to granulate. An example of a granulating pigment is PB29 (Ultramarine Blue).