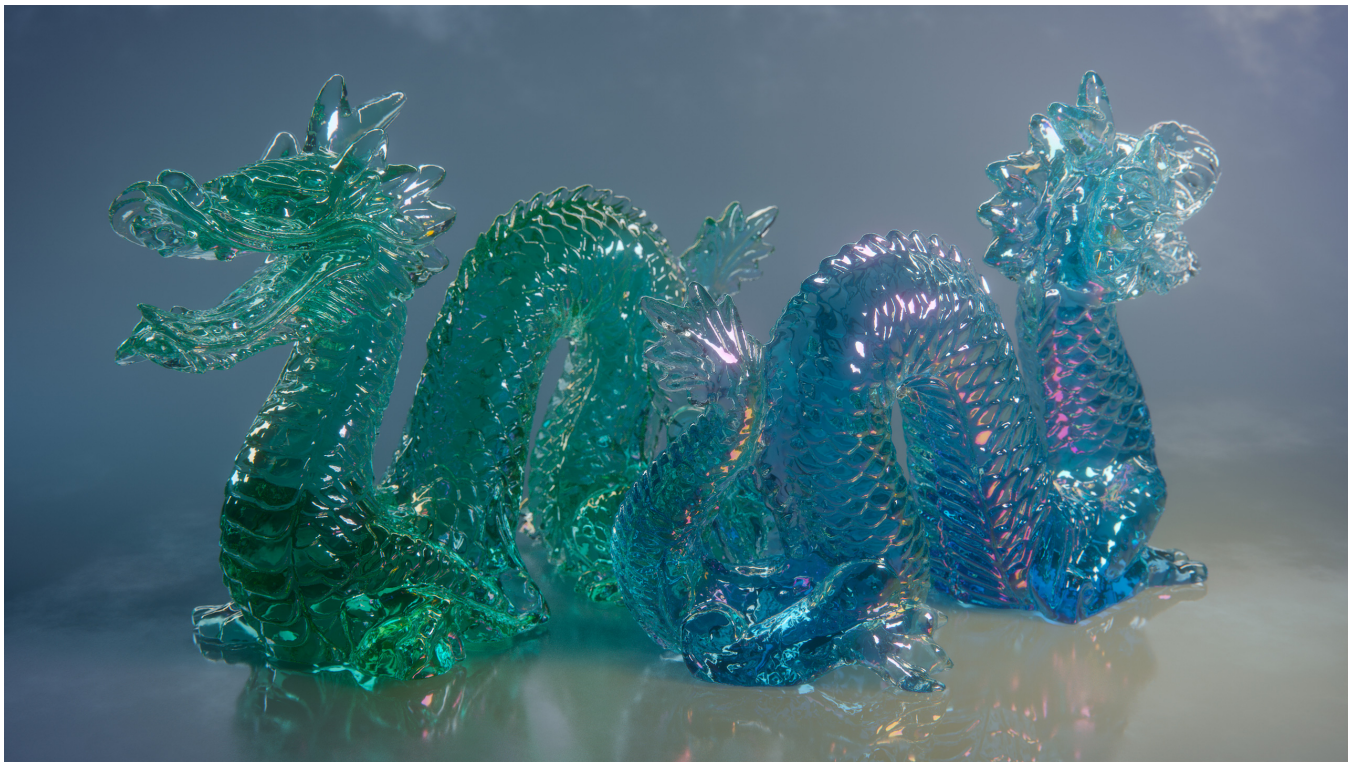
# 3Delight Glass



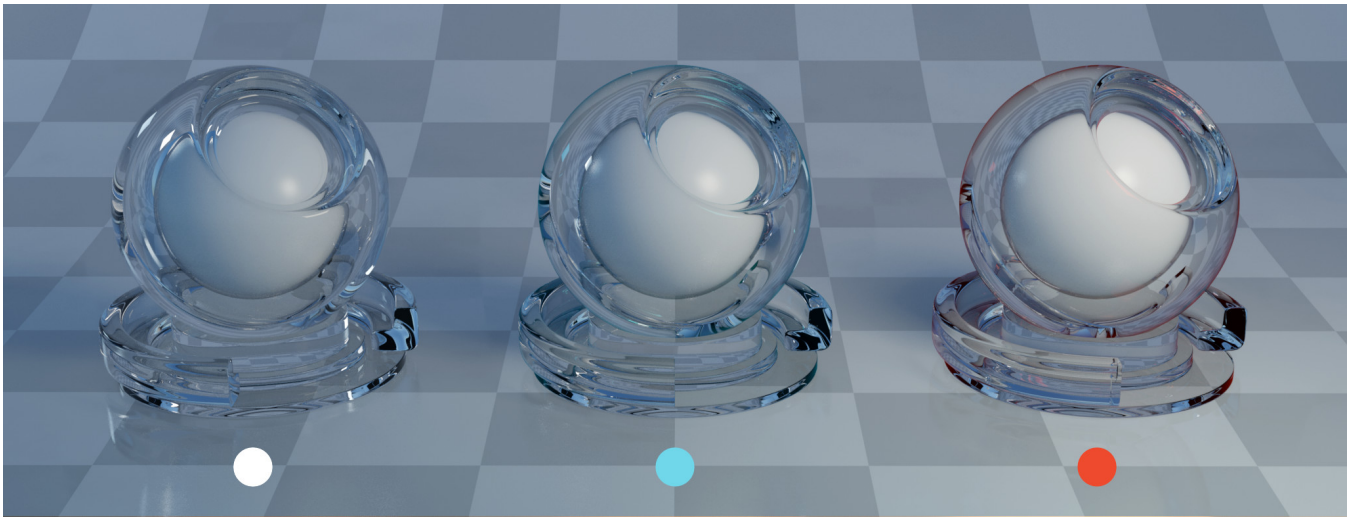
*3Delight Glass* allows rendering a variety of translucent materials, going from simple coloured glass and translucent plastics down to soap bubbles with complex light interference effects.  Under the hood is the production-proven GGX BRDF.

The material has two main components: reflection and refraction. Each of these components has it's own *roughness* and *index of refraction.* This might appear counter-intuitive but it allows to simulate a variety of interesting surfaces as shown in the parameter description below. As a supplement to these two components, *3Delight Glass* can simulate an additional *thin film* on the top of the surface. This thin film helps simulate real life surfaces such as tainted glass, oxidation and very thin materials.

## Reflection

**Color**

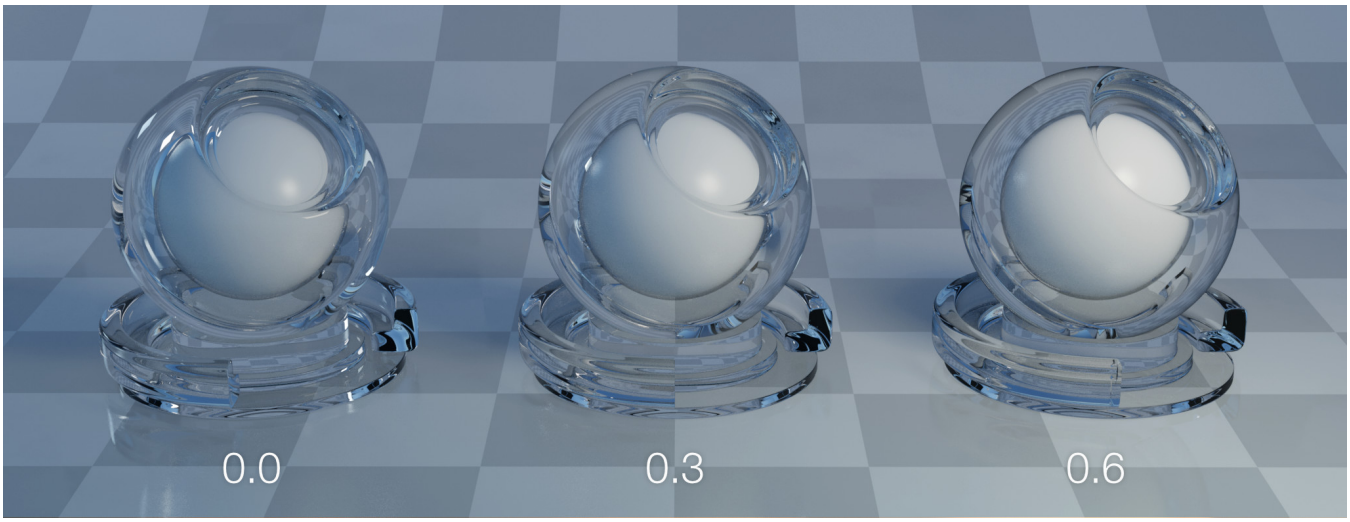
Specifies the color for reflections.



> **TIP**
>
> Glass can't have coloured reflection or refraction. It reflects and refracts light unaltered. Plastics on the other hand produce coloured reflections and refractions and this colour should be set to the colour of the plastic.

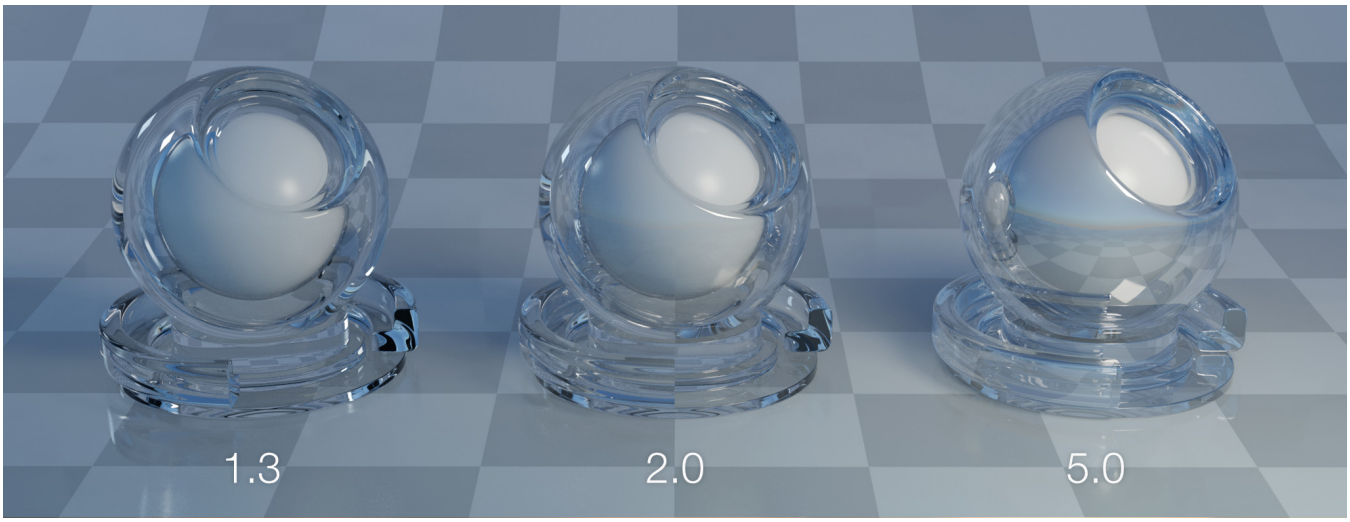
**Roughness**

This controls the specular roughness (for the GGX BRDF). The larger the value, the rougher is the surface. A roughness of zero generates mirror reflections.




**IOR**

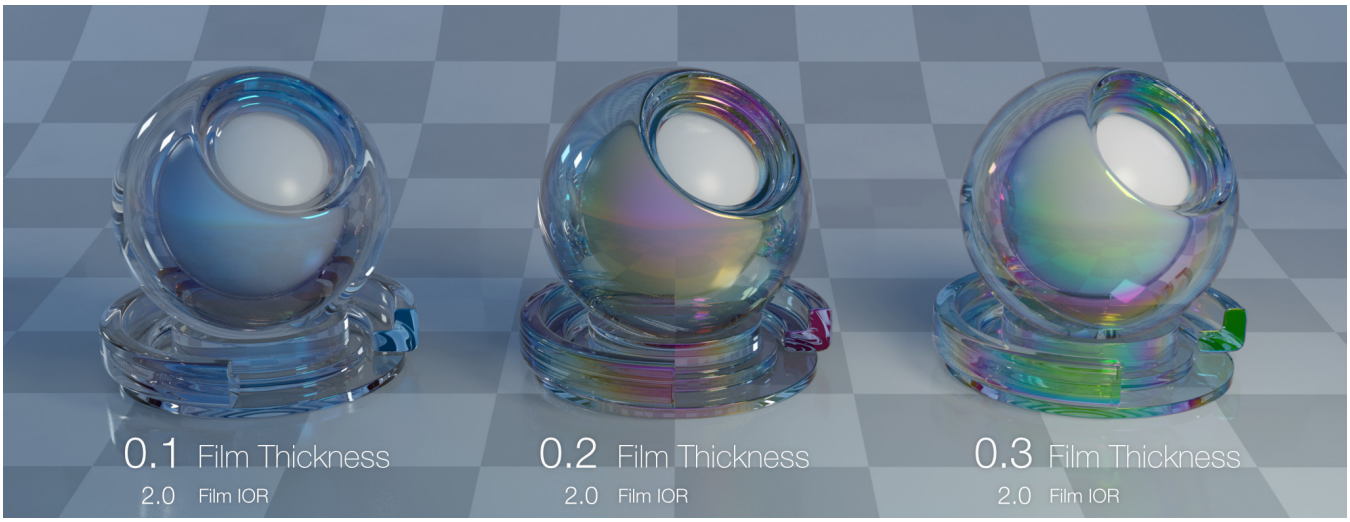
The index of refraction to use to calculate Fresnel *reflections*. Higher values generate more prominent specular reflections. Note that there is a separate controls for *refractions*.




**Thin Film**

Enables thin-film interference. Thin film interference is a complex phenomena that depends on many variables, including viewing position and usually generates rich patterns on top of the rendered surface. 3Delight performs a physically correct light interference simulation of this phenomena.

**Film Thickness**
Specifies the thickness of the film in ucm.

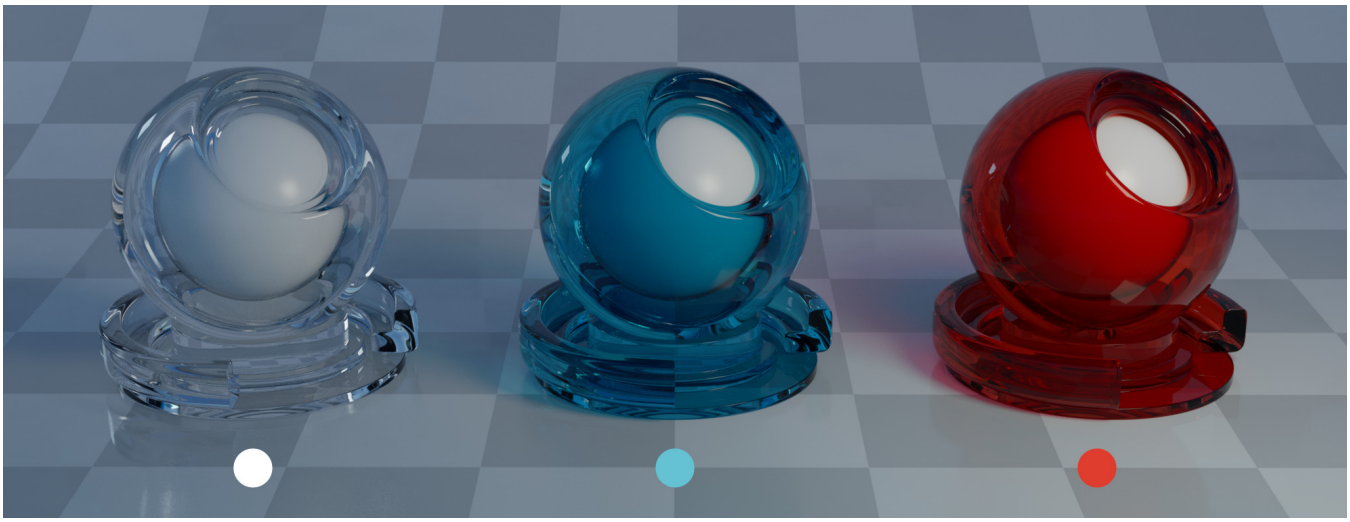



**Film IOR**
Sets the index of refraction of the thin film. This value depends on the material of which the thin film is made. Even if specific index of refractions are needed to simulate real life phenomena (e.g. use an index of refraction of 1.458 for the thin film of silicon dioxide formed on glass because of thermal oxidation) one can simply adjust this value to obtain the desired look.

## Refraction

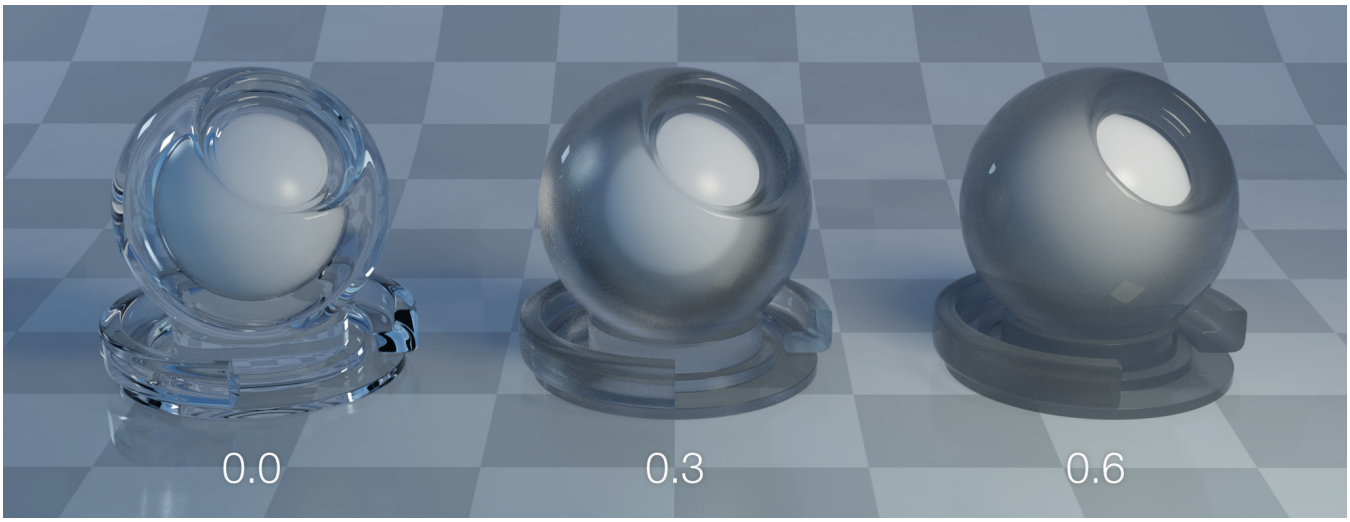
**Color**

Sets the color of the refraction.Setting this color to 0 disables refraction.  See comments in reflection color for further information.



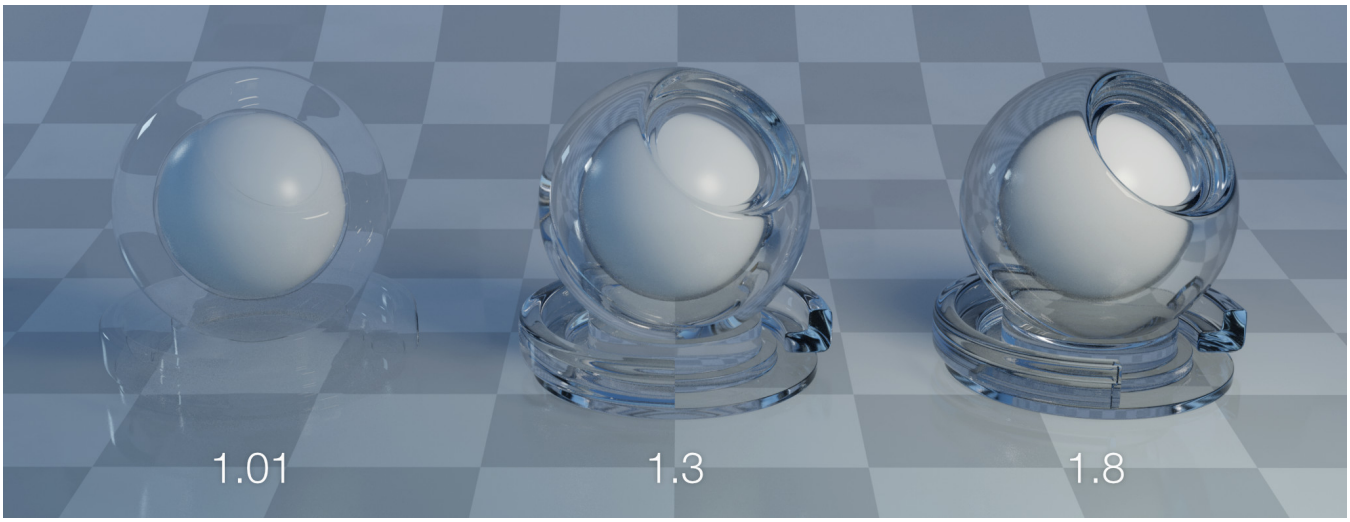
**Roughness**

Sets the roughness of the refraction. The smaller the value, the smoother is the surface. Higher values can be used to emulate "ground glass" and also help emulate more complex material interiors.




**IOR**

Sets the index of refraction for refractions.



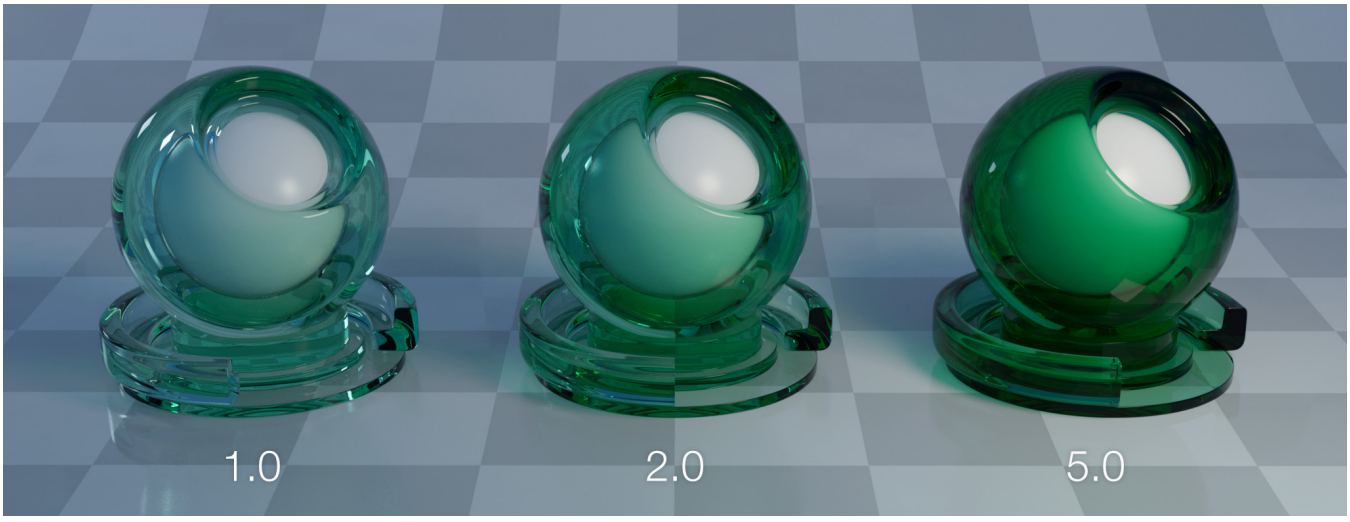

**TIP**

It is impossible for real world materials to have different IOR for reflection and refraction. It is useful in a context where 3D objects are not modeled properly. A good example is a soap bubble: the walls of the bubble are so thin that they are usually modeled using a single surface. In this case the IOR for refraction has to be set to 1 to simulate such a thin medium but the reflection could be set to a value higher than 1.

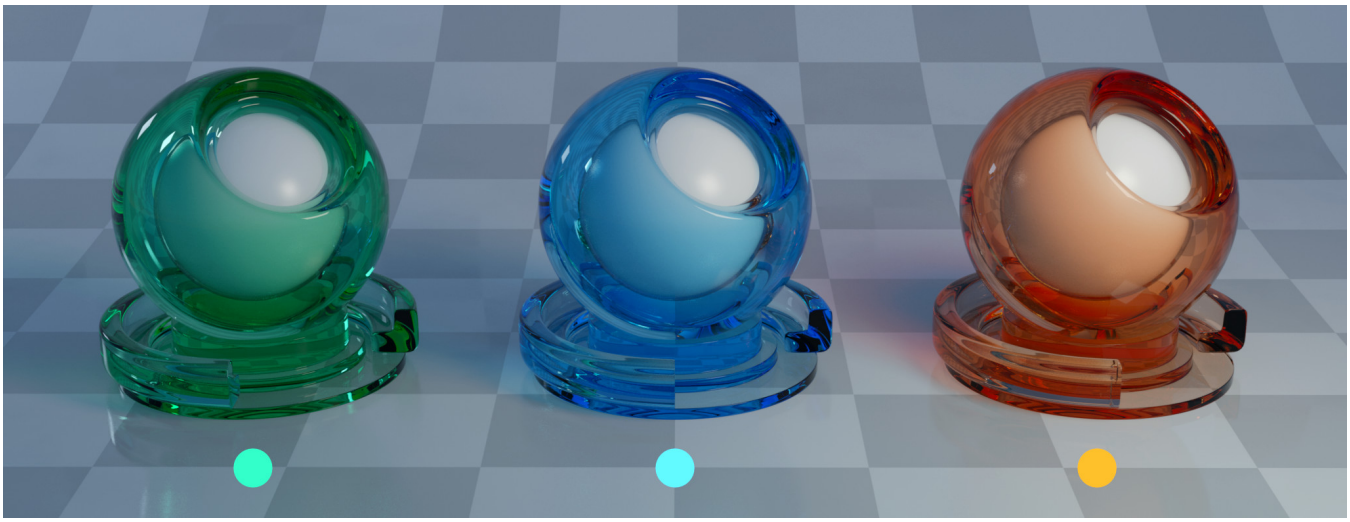
## Volumetric

**Density**

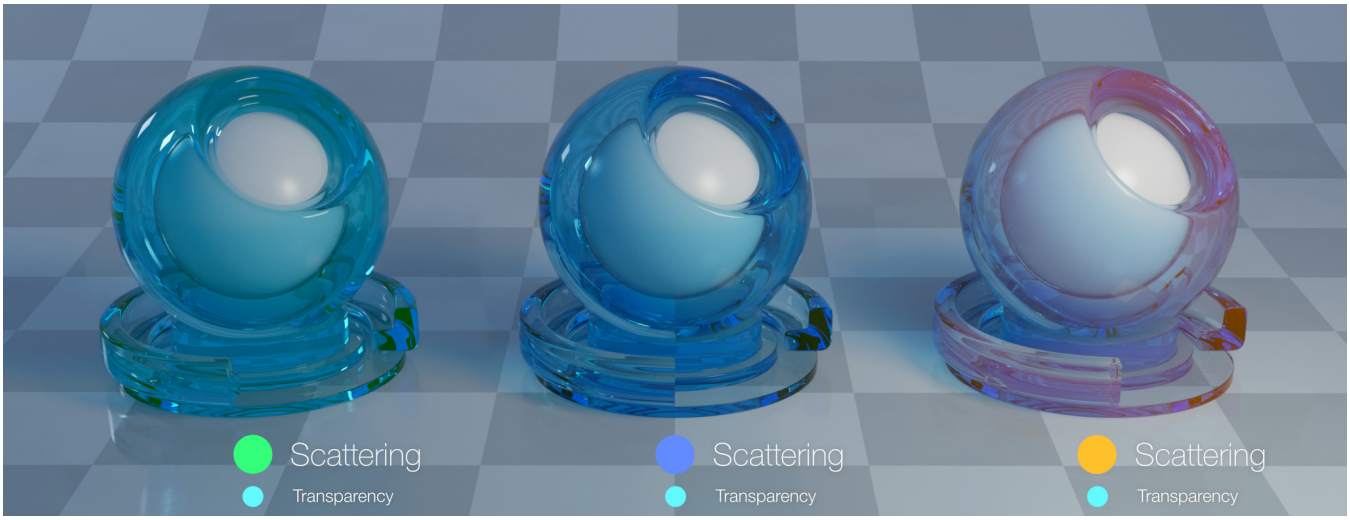
Specifies how dense the material is.




**Transparency**



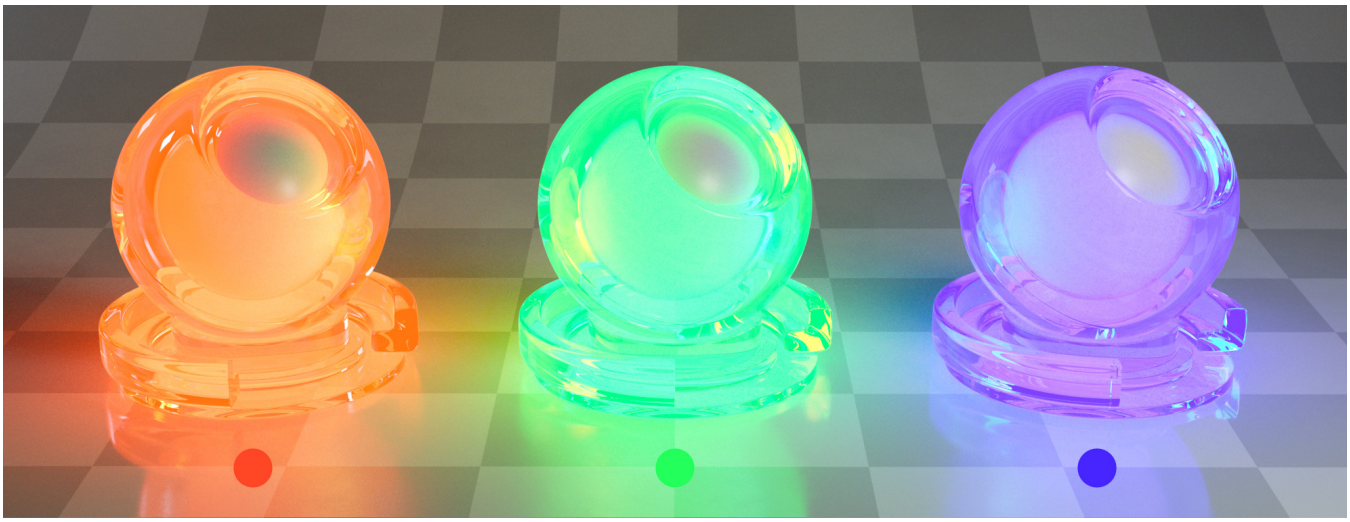
**Scattering**




## Incandescence

**Color**

The  colour the incandescence.



**Intensity**

The intensity of the incandescence.

## Geometry

**Occlusion Distance**

## Lookdev Example: Marbles

*We will try to approximate the look of this marble.*

| Observation | Relationship to 3Delight Glass Parameters | Render |
| --- | --- | --- |

| | | |
|---|---|---|
| The marble is made of glass and has both reflection and refractions (transparent). | We choose an IOR of 1.3 ("light" glass) for both reflection and refraction and dial in the same color for both effects. | |
| We have and overall bluish color. Note that some part of the marble are still white (reflection of sky). | We definitely need a blue color for the "interior" of the marble. But which parameter to use, *Refraction Color* or *Transmittance* ? Since the inside of the marble is solid, *Transmittance* is the best choice because it will simulate an exponential light falloff.<br><br>Transmittance = blue with a strength of 2.3<br>Refraction Color = leave white | |
| The interior of the ball is "fuzzy" while the reflections are mirror-like. | We can simulate such fuziness by using a *Refraction Roughness* larger than 0.<br><br>*Reflection Roughness = 0*<br>*Refraction Roughness = 0.15* | |
| There is a pink gradient on top of the sphere. This effect is recognizable as thin-film interference. In this case the marble must have some kind of very thin cover or has been heated and an oxide must have formed. | Simply enable thin-film interference and try to guess the IOR of the thin-film. As an educated guess, we set the IOR to 1.458 which is the index of refraction of silicon dioxide, a material that forms when glass is heated. Not surprisingly, we get a close enough match.<br><br>Film Thickness = 0.25 ucm<br>Film IOR = 1.458 | |

So we have a render that has many of the features of the original image. To continue the look development, one can use better lighting, internal object structure (air pockets) and varying thin-film thickness.