Fresnel Procedural study.

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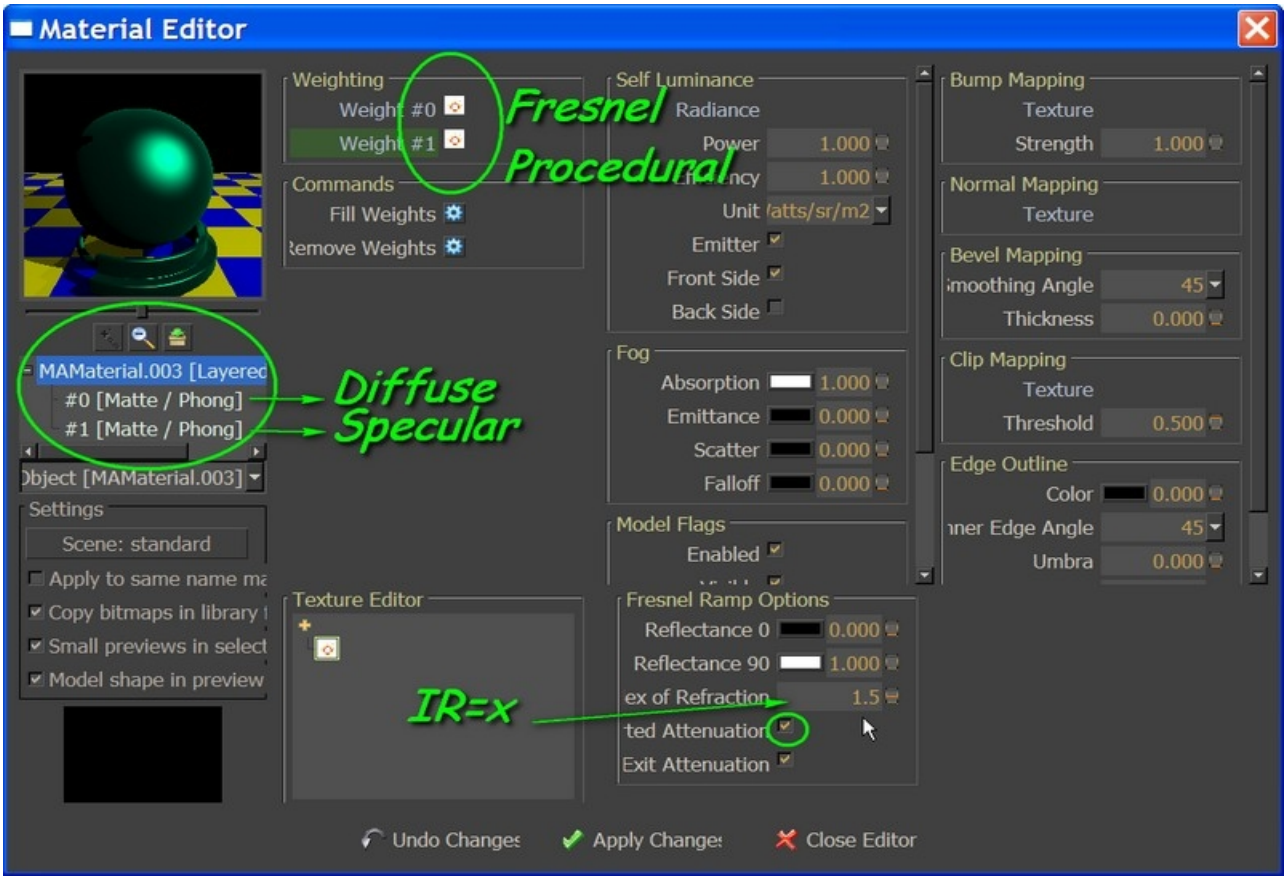
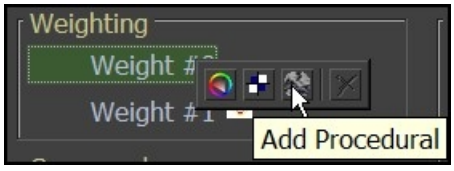
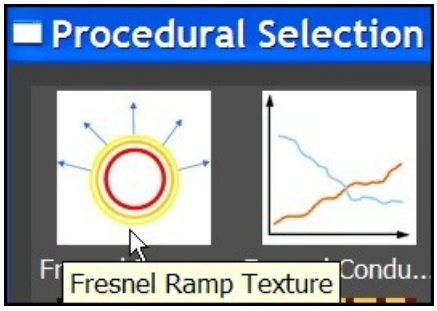
As I am studying the various materials produced and shared into this place, I can observe that we often find the following schematic procedure: a layered material with two layers: one for Diffuse and the other one for Specular.



A reason for using these multiple layers seems to be that we can manage different things at the level of the layers weight.



Especially, this manner allows to play with Material's *Index of Refraction (IR)* through the use of *Fresnel Ramp Procedural* (positive and inversed attenuation).



Fresnel Study

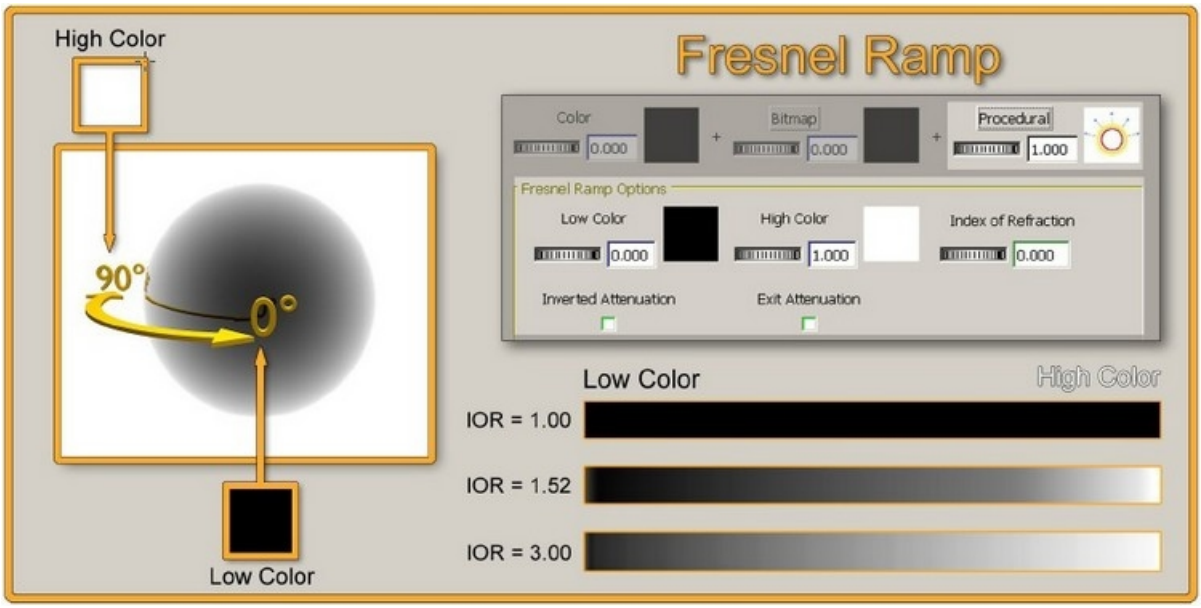
As the use of this Fresnel ramp Procedual is not so evident to me, I have made a study
So here it is: May be it will be useful for someone else ***;-)***

First, a reminder taken from ***Patrick Nieborg KerkyThea material Editor***

http://www.kerkythea.net/joomla/index.php?option=com_remository&Itemid=42&func=fileinfo&id=49

"patrick's Material Editor p10, p26"
Fresnel attenuation is how the reflection/refraction behave on the material;
most common materials have a Fresnel attenuation which makes the object more reflective when looking at glazing angle.
The Reflection strength is controlled by the IOR value.
Increasing the IOR value, increases the reflectance at 0 degree viewing angle (at 90 degree viewing angle reflectance is always 100%).

Fresnel Ramp works the same way as the Fresnel attenuation option we have in the Material component panel but with the difference that we have more control over it.
By default the IOR value is 0.000 and will act like a cosine attenuation (useful for velvet and satin materials).
To get accurate Fresnel attenuation we need to set IOR higher than 1.000.
Depending on the IOR we set, Fresnel will calculate the according gradient between the Low Color and High Color.



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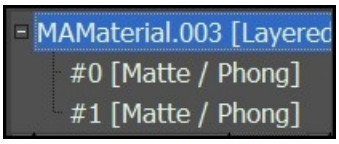
As said above the process is constituted by:

One Layered material with two layers.

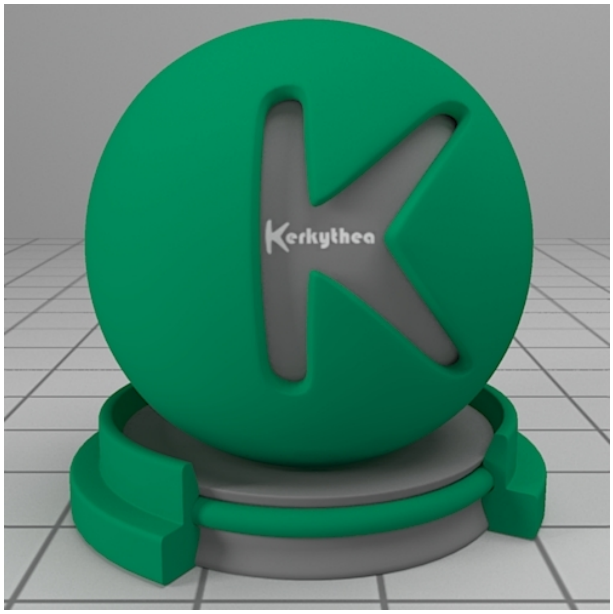


Layer #0: Diffuse options

Layer #1: Specular options

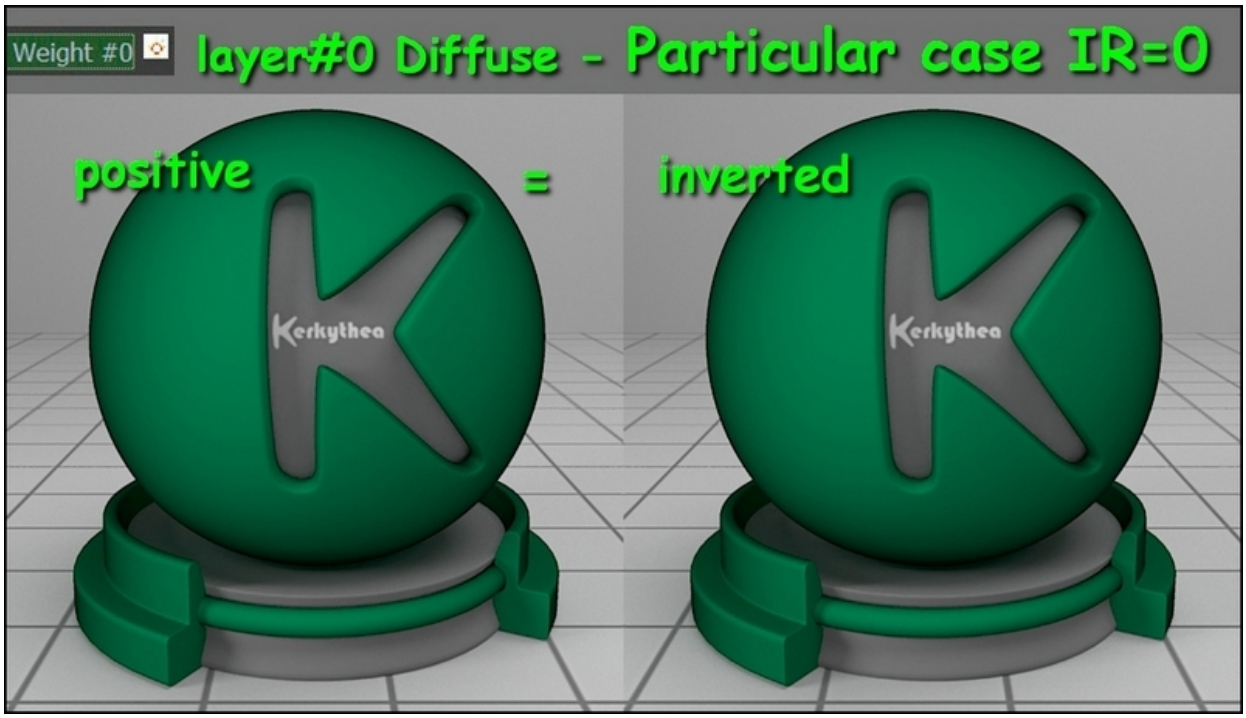
I need first a simple color ball reference

green color: 0_138_91



I want to see the default IOR value=0 with Diffuse layer

IOR=0 → *" act like a cosine attenuation"*



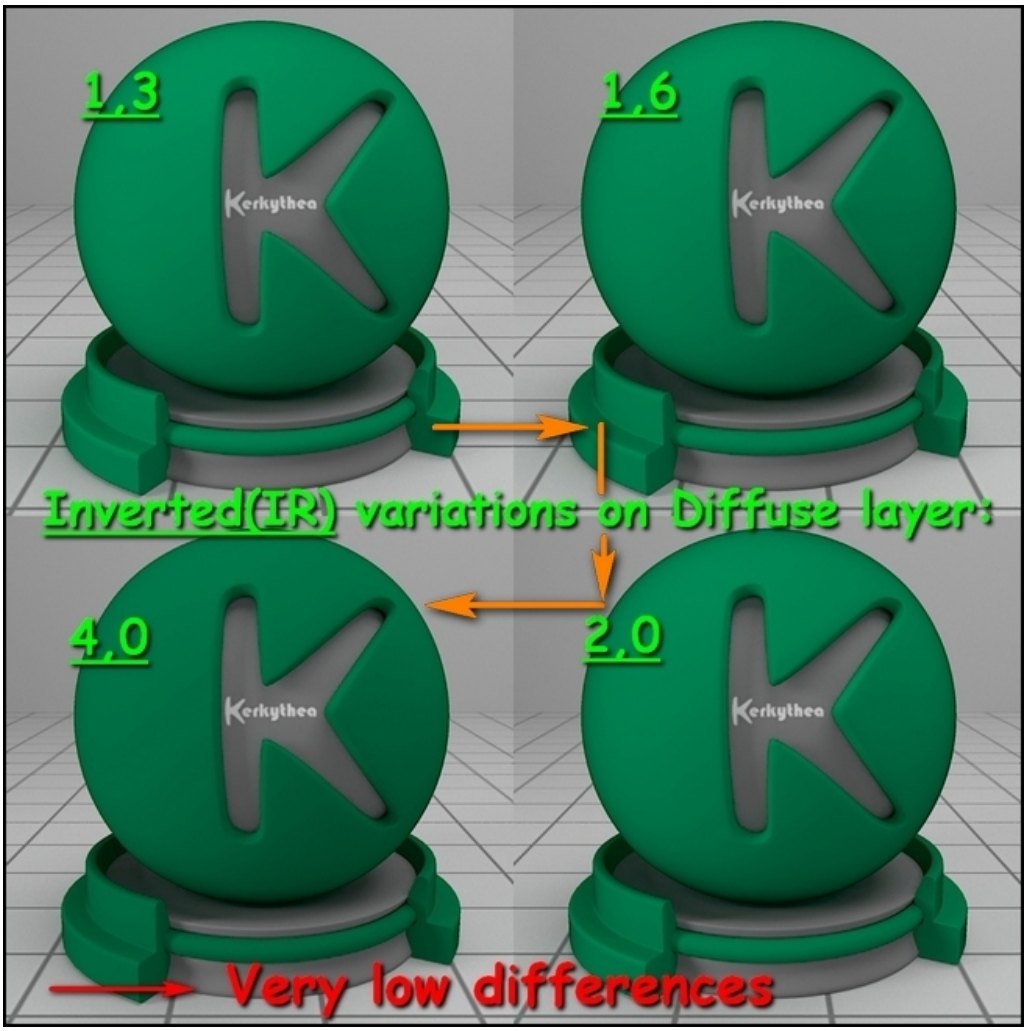
Another Particular case: IOR= 1 (IOR of the air) ---------> incidence angle=refraction angle

IOR=1

It is now time to see how IOR varies !!!

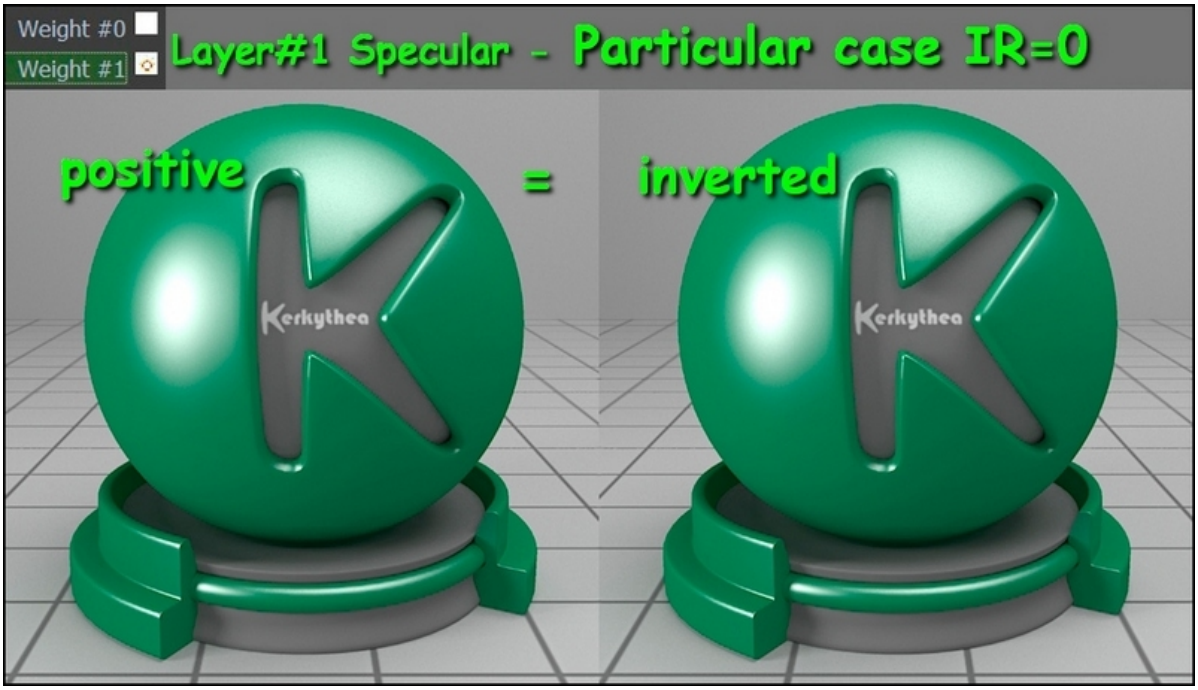
A better view With IOR=1,6

RE: What happens with Diffuse layer's IOR “inverted” variations ?

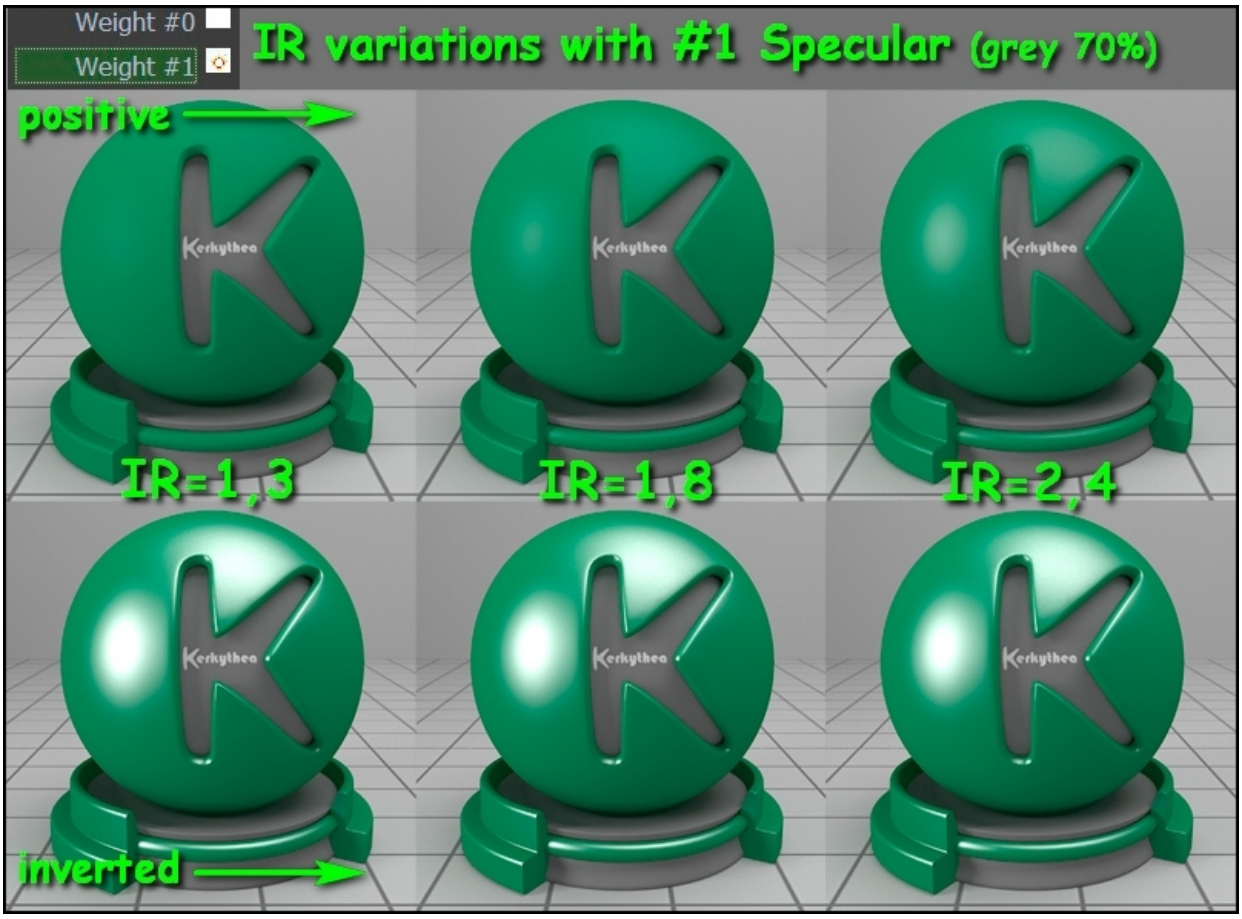


Now, I study IOR effects on Specular layer

Like above, the basic result with IOR= 0 default value



And how IOR varies !!!



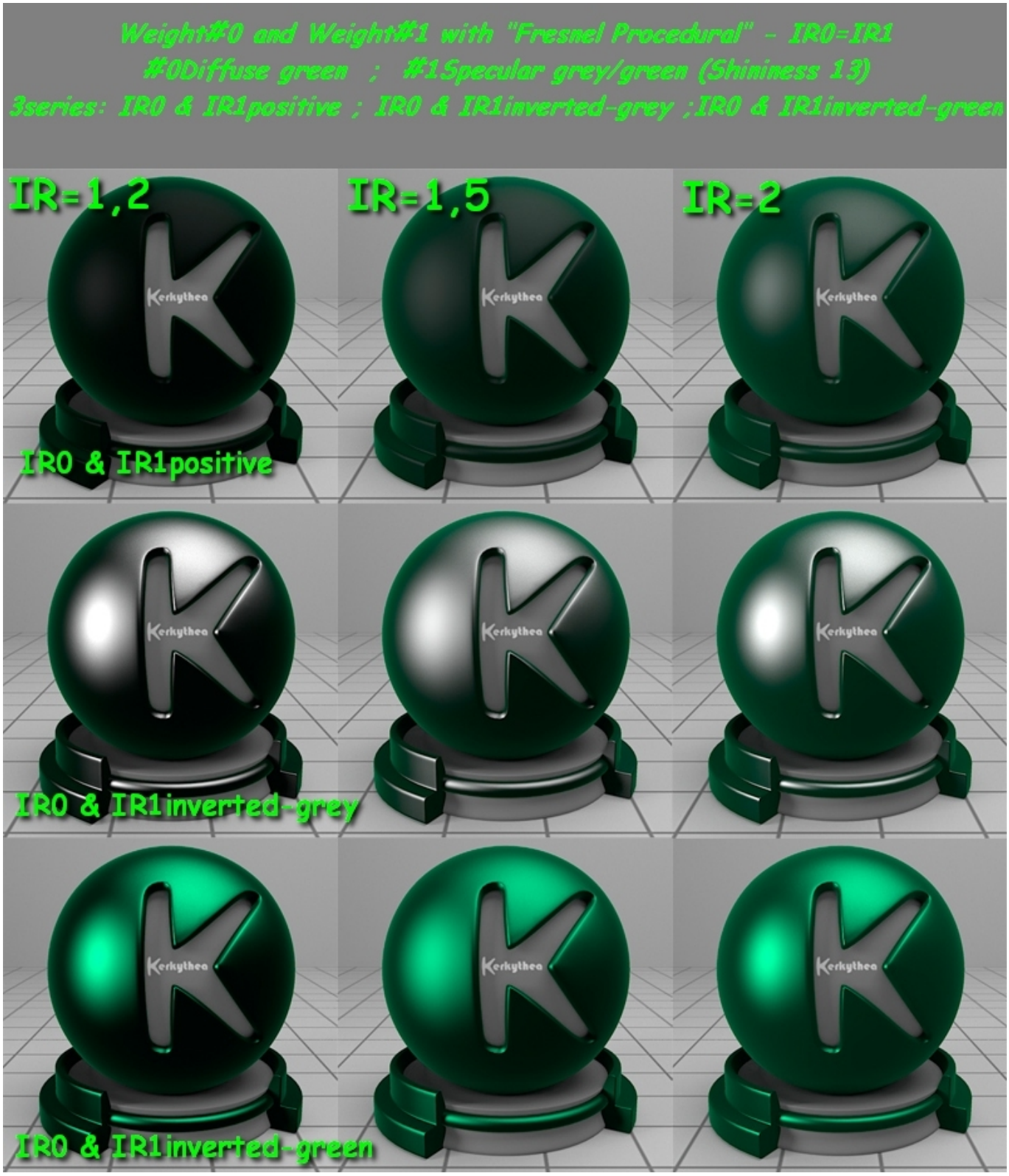
--->We can say that there is not so much variation effects on Specular layer!
Also that we are probably going to play mainly with the Inverted IOR....

It is time now to play with Fresnel ramp on both Weights

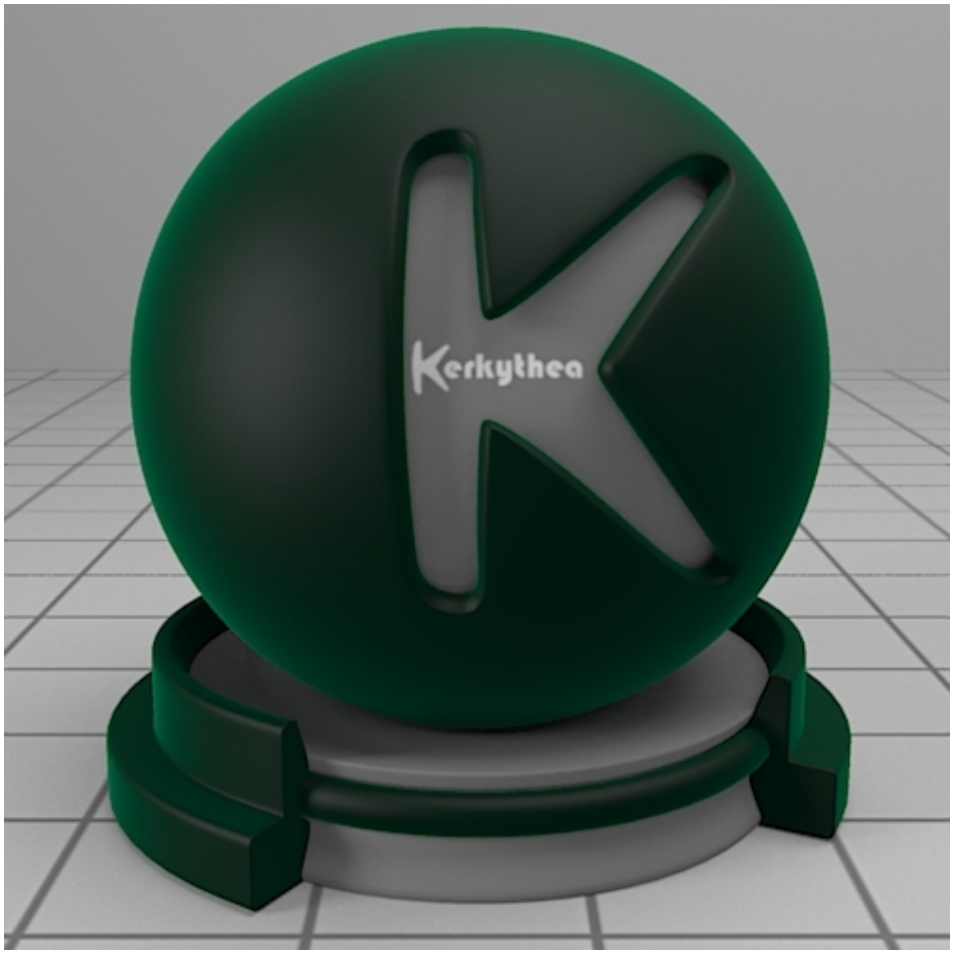
3 series where I only play with Diffuse IOR positive:
-1) IOR0 & IOR1_positive
-2) IOR0 & IOR1_inverted (

70% grey)
-3) IOR0 & IOR1_inverted (

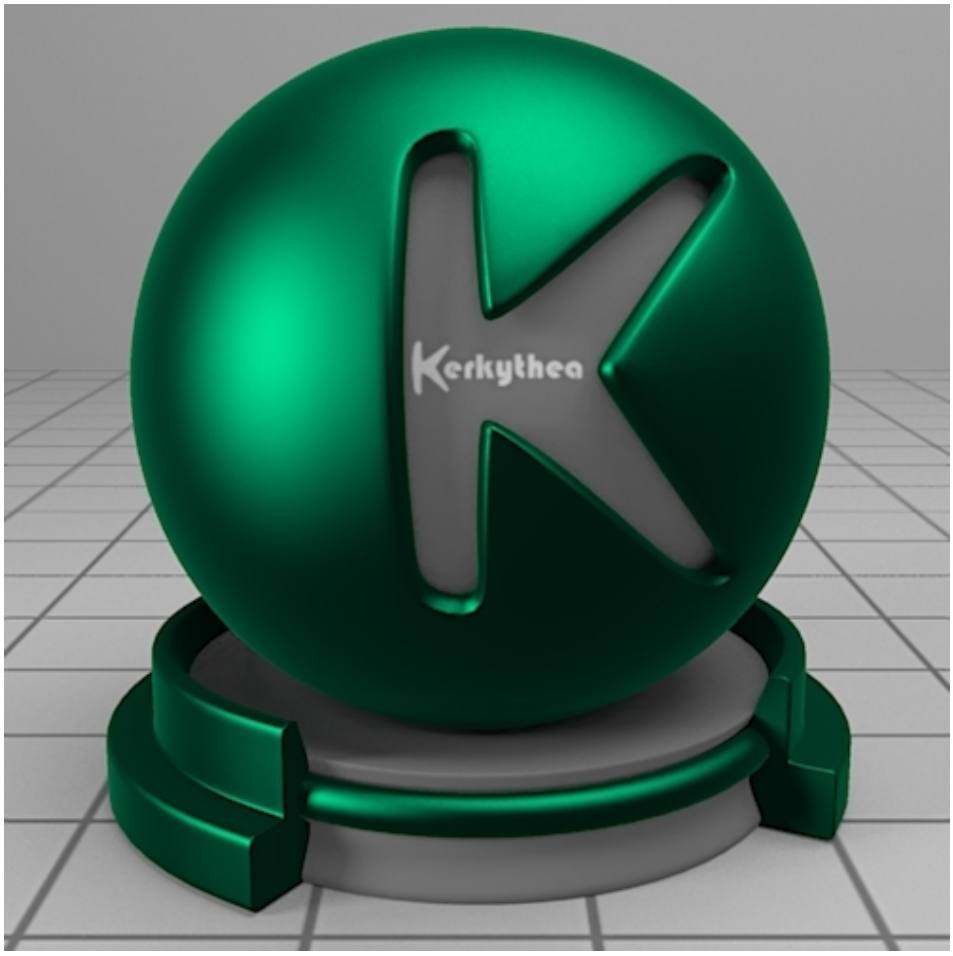
same but lighter green 0_165_109)



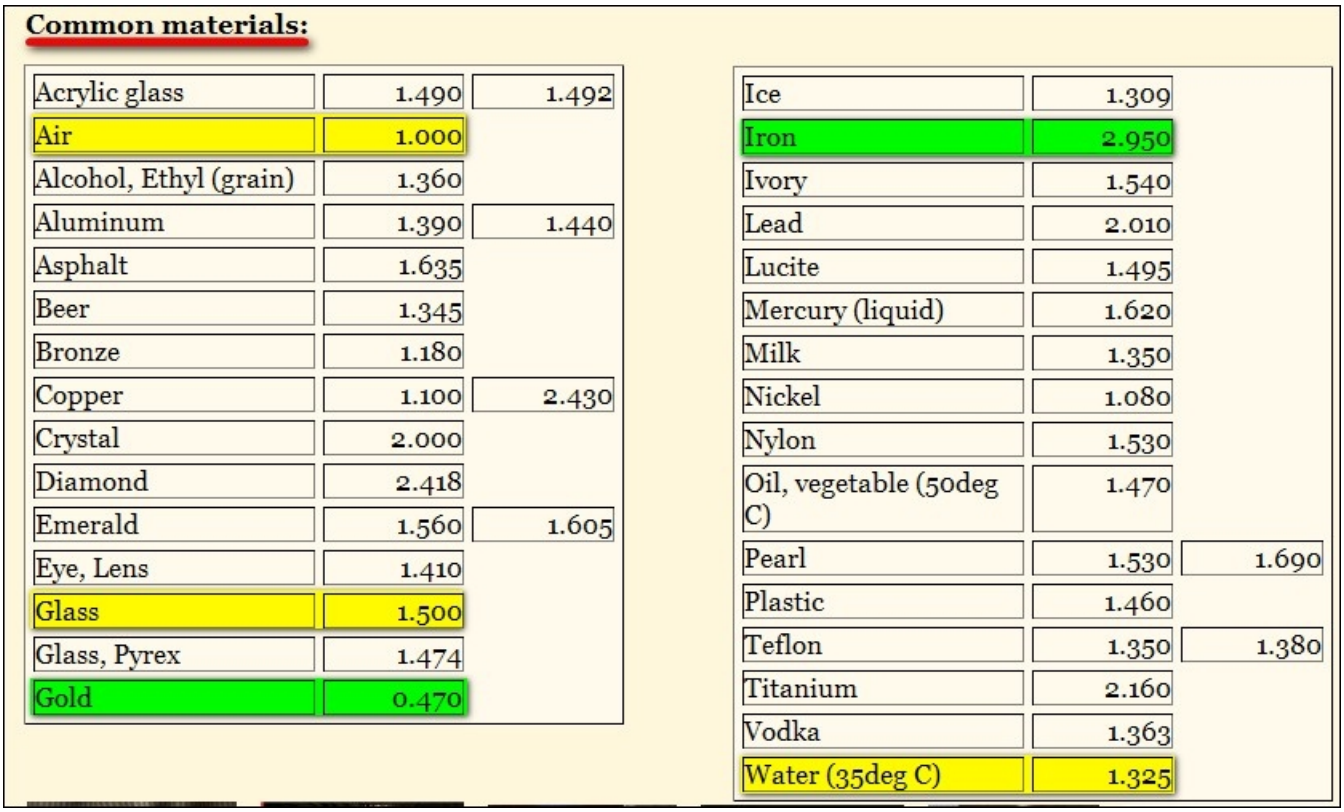
A Better view with: IOR0 & IOR1_positive= 1,5



IOR0 & IOR1_inverted_green=1,5



Some Common material Index of Refracion:



Common materials:

Acrylic glass	1.490	1.492
Air	1.000	
Alcohol, Ethyl (grain)	1.360	
Aluminum	1.390	1.440
Asphalt	1.635	
Beer	1.345	
Bronze	1.180	
Copper	1.100	2.430
Crystal	2.000	
Diamond	2.418	
Emerald	1.560	1.605
Eye, Lens	1.410	
Glass	1.500	
Glass, Pyrex	1.474	
Gold	0.470	

Ice	1.309	
Iron	2.950	
Ivory	1.540	
Lead	2.010	
Lucite	1.495	
Mercury (liquid)	1.620	
Milk	1.350	
Nickel	1.080	
Nylon	1.530	
Oil, vegetable (50deg C)	1.470	
Pearl	1.530	1.690
Plastic	1.460	
Teflon	1.350	1.380
Titanium	2.160	
Vodka	1.363	
Water (35deg C)	1.325	

IOR reference links on the net:

Pixel and Poly - Design Focused Creative Services
http://www.pixelandpoly.com/ior.html

and this very useful one:

IOR.INFO - Refractive index database
http://refractiveindex.info/

Cheers,

simonlebon 09 Novembre 2010.