

Translucent Materials

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This is a great tutorial for creating materials for things such as candles, grapes, skin, leaves, and paper.
General Before going into detail about vfr options to create translucent materials, it's best to have some basic knowledge about what translucency is.

http://www.neilblevins.com/cg_education/translucency/translucency.htm

Translucency is the effect of light passing through and scattering inside an object. Normally in 'simple' vray materials, light hits a surface, and bounces off to a certain degree. With refractive materials, light rays also pass through the surface, bending under a certain angle (IOR). If translucency comes in, the refracted ray doesn't simply run straight through the object, but instead it gets scattered in all directions. Examples of real life stuff where translucency is very visible are candles, grapes, orange juice, skin, leaves, paper, etc ...

candle:

juice:

juice_02:

plastic:

paper:

When looking at the images, one very important factor can be seen: the placement of the lightsource. Translucent effects are especially visible with strong lights, placed inside or behind an object. For example the orange juice, the translucent effect is almost gone in the picture where the light is much more even. It's still visible, but much more subtle than when you light it with a flashlight.

Another thing to note is the thinner the objects, the easier it is to see the translucent effect..

Besides the examples shown here, other situations where you would like to have translucency are when some objects are trapped inside of each other. For example the bones in the human body, or the seeds in grapes. When you hold a strong flashlight under your hand, you will notice the hand will light up red, and you will see where your bones are located because they don't let light through and therefore will be much darker. Same for grapes, if you light them from behind it will become clear that there are seeds in them, which isn't obvious when lit with a normal even lightsource. In the flesh example, the color turns red because of the blood in it, while the surface color is pink/brown. So for all these cases, translucency can be used to recreate the effect in your rendering.

Absorption Let's start with the real thing now. First of all, we will create translucent effects without using translucency. Sounds silly, but it's not.

To do so, we will use the absorption property of the vray material. In vray, this is called 'fog'. The basic theory is that when a light ray hits a refractive surface, it gets bent off, and travels further through the surface, to come out on the other side. With absorption, the ray loses intensity the further it travels through the object. What this means is that the thicker the object, the more energy is lost, the darker it will appear. So if you have an object with thick and thin parts, the thin parts will be very transparent, and the thick parts will look more opaque (or dark transparent).

Images 0201 and 0202 show the difference between the usage of a refraction color or a fog color. The first uses a red refraction, and white fog, and the second uses a white refraction and red fog. As you can see, the second one is much nicer.

* 0201:

- 0202:

Now we will use this fog effect to create translucent looking materials.

Open the scene `absorbtion_start.3dm`. The scene has a dim skylight, GI is on, two rectangular lights placed behind the objects. I used some low quality settings to speed up rendering. In color mapping, gamma is set to 2.2. Read the LWF tutorial for more info on this. Gamma 2.2 is crucial to get translucency to work well. The objects have the material from the previous renders, nut without the reflection layer, as we don't need that right now. You can see that I used a medium red color for fog, with a 0.2 multiplier.

Render the scene, you'll get image 0203. Play with the fog multiplier to see how it affects the transparency of the material.

* 0203:

To get the translucent effect, we will now turn on 'glossy refraction'. You turn it on by simply setting the glossiness lower than 1.0. Try 0.8 for now and render. See image 0204.

* 0204:

Now try glossiness set to 0.5 and render. See image 0205. Starting to look more like translucency now!

* 0205:

Now we will lower the refraction IOR. Set it to 1.1 Image 0206

* 0206:

Now try a medium grey refraction color. Image 0207

* 0207:

You see that with all these settings, you can already get a lot of effects. The lower the glossiness, the more blurry the refractions will be. The darker grey the refraction, the less light will pass trough. Fog multiplier determines the effect of the fog color, low values will wash out the color, high values will make it stronger.

Image 0208 is rendered with some different settings, and with better quality. This is the result when you render scene `absorbtion_step_01.3dm`

* 0208:

Translucency Now open scene `absorbtion_step_02.3dm`. I reverted back to low quality settings. Turn on translucency in the glass material and render. The objects will be black ...

Go to the options tab of the material, and turn off 'double sided'. Render again, we now have a true translucent rendering! Image 0209

* 0209:

Change glossiness to 0.8 and render. Image 0210. You see the effect of this is quite similar than without the translucency turned on.

* 0210:

Change refraction color to a very dark grey (30,30,30). Render. Image 0211. * 0211:

Also try a very light grey. Image 0212.

* 0212:

Experiment again with different combinations of refraction color (go from white to black, only greyscales), fog color, fog multiplier, glossiness. I use only greyscale for refraction color to keep the number of colors to a minimum. Simply see the refraction color as some kind of transparency control, dark is opaque and light is transparent. So the color now is only controlled by the fog color.

Usually translucency is a combination between a surface color and the color inside the object. Until now, we didn't use the diffuse color at all, its transparency control was set to pure white, meaning 100% transparent. For example to create flesh, you need the combination of the pink/brown skin and the deep red of the blood.

Open scene absorbtion_step_03.3dm. Render. Image 0213.

* 0213:

Look at the material settings. A lot like before as you can see. The goal now is to create a flesh material. As you can see here, the rendering looks like the blood only ... The diffuse flesh color isn't showing trough.

I already changed the diffuse to something like a flesh color. The only problem is the transparency control for the diffuse layer. We need to turn this into a more dark grey, so that some of our diffuse layer will also show up. Set it to a 70,70,70 grey and render. Image 0214.

* 0214:

As you can see, now almost only the diffuse shows, only in the thin parts the blood color comes trough. This is more how flesh behaves. The lighter you set the diffuse transparency slot, the more the blood will show trough.

Here's a higher quality image I made: Image 0215. Open scene absorbtion_step_04.3dm if you want to see the settings I used.

* 0215:

There are two parameters in the translucency option, scatter coeff and fwd/bck coeff. I always set them to 0.5, because I don't really know what they do. ;o)

The thickness parameter controls how deep light can penetrate inside the object (in units). I always leave this at a high value, because I rather control how deep it should go with the refraction color and fog multiplier.

Here's a summary of how I use the translucency settings:

- First determine the diffuse color of your material. Test it under normal lighting to see if it looks right.
- Then think of the color inside the object. Is it different than the diffuse or not? If not, make your fog color similar to your diffuse. Sometimes a less saturated version of your diffuse works well. If the inside color is different, then choose your fog color as you wish. Try to avoid rgb values of 255. If you want a white fog, use a light grey instead.
- Then make up if the material top surface is very transparent or not. If not, a lot of the diffuse will show up and not much of the inside. So you need a dark transparency color for your diffuse. Use only greyscale here. If the top surface is very transparant, use a lighter transparency color. For example for skin use a pretty dark diffuse transparency, for grapes you can use a lighter transparency. The grape surface is more transparant than the skin surface.
- Then think about the inside again. Is this very transparant? If yes, use a light grey refraction color. If not, use a dark grey. If the inside material is the same as the outside, I recommend using the same refraction grey as you used in the diffuse transparency slot. Use only greyscale values here, otherwise you'll get a color mix with your fog color which usually results in unexpected looking materials ...
- So the fog color and its multiplier are also important here. Low multipliers will reduce the fog effect, also washing out your fog color. There is a difference too between a light, unsaturated fog color with a high multiplier versus a dark

saturated fog with a low multiplier. This is however a bit unclear and can confuse you a lot. I usually use a medium saturated, medium dark fog color.

- Then use the glossiness parameter to control how much the light should scatter inside the object. The higher the glossiness, the more straight the light will travel. The lower, the more the light will scatter around.
- Test render a lot, because the material will look different under varying lighting conditions. So the material preview will not be that accurate because your scene will probably be lit very differently.
- Remember that to see the translucent effect, it's best to back light your objects. You don't see translucency of flesh under normal lighting conditions, but you do see it if a bright spot shines behind you when you stand in a dark room (for example an actor on a theater stage).
- Translucency is very time consuming. You need high subdivs to get it clean ... Only use it when you really need it!

Here are some translucency examples quickly created in Vray for Rhino. Note that they can be optimised a lot probably...

candle:

paper:

wheels:

Examples files:

- candle.3dm: candle.3dm

- wheels.3dm: wheels.3dm

- paper.3dm: paper.3dm