

The MTL file explained

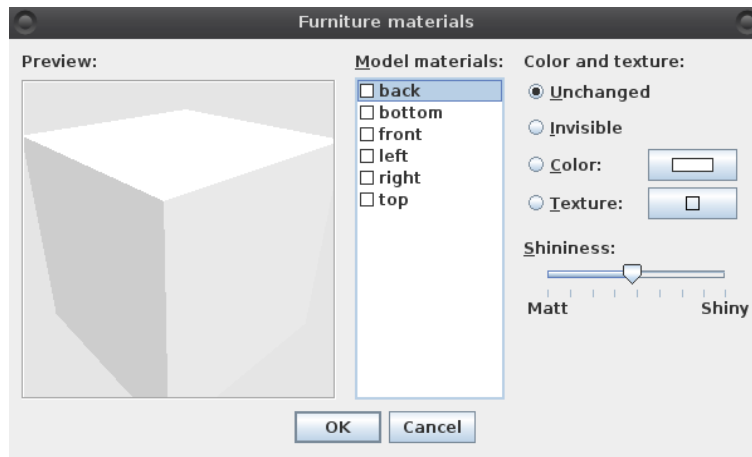
Purpose

This manual explains the different values used in the MTL file that accompanies the OBJ file of a 3D model.

Introduction

When you modify furniture the dialog shows the material names used in the model.

For example the Box looks like this:



The box has six material names, one for each side: *back*, *bottom*, *front*, *left*, *right*, and *top*.

The materials are defined in the MTL file which is a simple plain text file. We will take a closer look at how the material definitions relate to what you see in Sweet Home 3D.

It is important to understand that Sweet Home 3D only supports a very basic format of the MTL file. This means that some values might be ignored in Sweet Home 3D but they might be used by the renderer for photos. This also means that some values will only be seen when you render a photo if the renderer supports those values.

A basic MTL file

```
# comment
newmtl bottom
illum 1
Ka 0.0 0.4862745 0.11372549
Kd 0.0 0.4862745 0.11372549
Ks 0.0 0.0 0.0
Ns 1.0

newmtl top
illum 1
Ka 0.0 0.4862745 0.11372549
Kd 0.0 0.4862745 0.11372549
Ks 0.0 0.0 0.0
Ns 1.0

newmtl left
illum 1
Ka 0.0 0.4862745 0.11372549
Kd 0.0 0.4862745 0.11372549
Ks 0.0 0.0 0.0
Ns 1.0

newmtl right
illum 1
Ka 0.0 0.4862745 0.11372549
Kd 0.0 0.4862745 0.11372549
Ks 0.0 0.0 0.0
Ns 1.0

newmtl back
illum 1
Ka 0.0 0.4862745 0.11372549
Kd 0.0 0.4862745 0.11372549
Ks 0.0 0.0 0.0
Ns 1.0

newmtl front
illum 1
Ka 0.0 0.4862745 0.11372549
Kd 0.0 0.4862745 0.11372549
Ks 0.0 0.0 0.0
Ns 1.0
```

First notice that the material names as you see them in the *modify furniture* dialog (bottom, top, left, right, back, and front) are each represented in the MTL file with a few lines below the material name. All materials are in a block of lines that start with “newmtl” followed by the material name. The lines following the name define the material until the next material definition starts: these are the material properties.

Material properties

Of course the most interesting part of the MTL file is understanding what all those material properties mean.

Property	Value	Description
#	Text	A comment line.
Ka	r g b	The ambient color of the material. The default is (0.2,0.2,0.2);
Kd	r g b	The diffuse color of the material. The default is (0.8,0.8,0.8);
Ks	r g b	The specular color of the material. This color shows up in highlights. The default is (1.0,1.0,1.0);
d	alpha	The (non-)transparency of the material to be alpha. The default is 1.0 (100% = opaque).
Ns	s	The shininess of the material. The default is 0.0;
Ni	l	Optical density.
illum	n	the illumination model used by the material.
map_Kd	filename	A filename containing a texture map (.png,jpg)

- The order in which the properties appear is not important.
- The RGB color values are in the 0 to 1 range. You can calculate these by simply dividing the normal RGB values by 255:
RGB(25,50,120) >
25/255=0.098039216 50/255=0.196078431 120/255=0.470588235 >
Ka 0.098039216 0.196078431 0.470588235
- Values can have multiple digits after the decimal point to precisely refine the value.

These properties require further explanation.

Ka is the ambient color of the material. The “normal” color as you set it for the material. Values can range from 0.0 to 1.0.

Kd is the diffuse color, **Ks** is the specular color. I take these together because they both represent a value for the reflection of light on the material. Simply said the diffuse color Kd is the reflection off a smooth surface and the specular Ks is the reflection value of a rough surface. They can both exist as a layer over the material because the material itself of course can't be both at the same time. Think of a rough surface with a thin layer of water on top. Light reflects on both the material surface and the water. Values for both can range from 0.0 to 1.0.

d is the value that sets the transparency of the material. This can be a value between 0 and 1 where 0 is fully transparent (invisible) and 1 is fully opaque.

This value is mostly used for glass materials. Depending on the usage a value of 0.4 to 0.5 is often used for glass. If you create double or triple pane windows in Sweet Home 3D remember to use a lower value for d because you have to see through two or three layers of glass. Experiment what look good for you but roughly the d values should add up to between 0.4 and 0.5.

Ni is the optical density of the material. In other words: how it breaks or bends the light when it shines through the material. The value is never created by Sweet Home 3D but of course you can add it manually when you edit the MTL file. For normal glass the value is around 1.45 ~ 1.5, values can range from 1 to 10.

Ns is the shininess of the material. Values range from 0 to 1000.

illum indicates the illumination model to use:

0	Color on and Ambient off
1	Color on and Ambient on
2	Highlight on
3	Reflection on and Ray trace on
4	Transparency: Glass on, Reflection: Ray trace on
5	Reflection: Fresnel on and Ray trace on
6	Transparency: Refraction on, Reflection: Fresnel off and Ray trace on
7	Transparency: Refraction on, Reflection: Fresnel on and Ray trace on
8	Reflection on and Ray trace off
9	Transparency: Glass on, Reflection: Ray trace off
10	Casts shadows onto invisible surfaces

Sweet Home 3D usually limits the usage of the illum value to 1 and 2.

illum 1: a flat material with no specular highlights, the value of Ks is not used.

Illum 2: the presence of specular highlights, so a specification for Ks is required.

Set illum to 0 to get a glow effect.

map_Kd sets a filename for the texture to use. There are more properties for other texture files (map_Ka, map_Ks, map_Ns, map_d) but they are not used by Sweet Home 3D.

When you download a 3D model from a 3Dmodel site the textures with those models can include those specific texture files but Sweet Home 3D will not use them if you add them to the MTL definition. If you're lucky the photo renderer will use them to get a better image.

References:

<http://www.paulbourke.net/dataformats/mtl/>

<https://www.loc.gov/preservation/digital/formats/fdd/fdd000508.shtml>

https://ocw.mit.edu/courses/6-837-computer-graphics-fall-2012/b86de2fe1a1084e56148f293da4a4dfd_MIT6_837F12_Lec15.pdf

<https://people.computing.clemson.edu/~dhouse/courses/405/docs/brief-mtl-file-format.html>