user changes the sampling rate s from the reference sampling rate s_0:

Equation 3 Formula for Opacity Correction

$$A = 1 - \left(1 - A_0\right)^{s_0/s}$$

To control the quality and speed of rendering, users typically change the maximum number of slices, or the relative sampling rate s/s_0, via the user interface.

Illumination

Illumination models are used for improving the visual appearance of objects. Simple models locally approximate the light intensity reflected from the surface of an object. The most common approximation is the *Blinn-Phong model*, which computes the reflected intensity as a function of local surface normal $\vec{n}$, the direction $\vec{l}$, and intensity I_L of the point light source, and ambient, diffuse, specular, and shininess coefficients k_a, k_d, k_s, and n:

Equation 4 The Blinn-Phong Model for Local Illumination

$$I = k_a + I_L k_d \left(\vec{l} \cdot \vec{n}\right) + I_L k_s \left(\vec{h} \cdot \vec{n}\right)^n$$

The computed intensity is used to modulate the color components from the transfer function. Typically, Equation 4 is evaluated in the fragment shader, requiring per-pixel normal information. In volume rendering applications, the normalized gradient vector is used as the surface normal. Unfortunately, the gradient is not well defined in homogeneous regions of the volume. For volume rendering, the Blinn-Phong model is frequently modified, so that only those regions with high gradient magnitudes are shaded (Kniss et al. 2002b).

Local illumination ignores indirect light contributions, shadows, and other global effects, as illustrated by Figure 39-8. Section 39.5 describes how to incorporate simple global illumination models into the rendering model for creating high-quality volumetric effects.