Translucency & Opacity

These are difficult parameters to explain and even more difficult to quantify.

Opacity
Most of the light rays are reflected or absorbed due to the presence of dense particulate matter within the object.

Transparency
Most of the light rays are transmitted due to the object being mainly devoid of particulate matter.

Translucency
Light rays are both transmitted and reflected due to the presence of discrete minute particles in the object.

These particles have the property of imparting a “glow” or “vitality” to the tooth, i.e., opalescence.

It would be prudent at this stage to dispel one of the great myths of color matching in the natural tooth. Translucency is currently one of the “buzzwords” in aesthetic restorative dentistry and clinicians, in their search for the invisible restoration, demand more and more translucency from their ceramists. Understanding of the previous paragraph would surely indicate that the desire is not for more semi-transparency but rather for more glow and vitality effects, i.e., opalescence.

A small point, but once grasped, the author submits that use of the term “opalescence” as opposed to “translucency” would convey a greater understanding (with significantly less confusion) as to the requirements of a particular restoration.

Fig. 18: Typical opalescent effects showing a blue comb-like halo in the incisal region and solid white opalescence in the middle third. Note the band of solid color at the outer edge of the halo.

Fig. 19: Longitudinal section of a central incisor. The relationship of the varying thicknesses of enamel and dentine is illustrated. The polychromatic effects caused by areas of dense chroma are clearly evident as are the opaque areas of dense particulate matter visible in the dentine. With thanks to Micerium and Lorenzo Vanini for permission to use this slide.

Fig. 20: Typical opalescent effects of enamel. Notice the blue incisal halo surrounded by a band of opalescent enamel. Areas of dense chroma and solid white opalescence are present in the incisal third and the whole surface is covered with a blue-white opalescence. Notice also the well-defined polychromatic influence of dentine, arranged in this instance, in definite bands of differing chroma.

Physiology of Natural Tooth Color

The observed color of a tooth results from the combined effects of the interaction of light with dentine and enamel.

Dentine Effects

The macro- and micro-anatomical structure of the dentine produces areas of high and low saturation of opaque color resulting in dentine being primarily responsible for the hue and chroma of the tooth. The scientific literature describes the predominant hue as being in the yellow-red range, but varies in quantification of this as being between 76% to 96%, with the remaining percentage leaning towards the yellow range. Using the Vitapan standard this would describe the hue of teeth as being predominantly in the A range with a small percentage of B shades.

Dentin tubular architecture, exhibiting varying diameter, frequency and an S-shaped distribution produces areas of dense and sparse mineralization. The various micro-anatomical structures, tubular architecture, combined with the overall gross anatomy of dentine result in areas of differing refractive indices resulting in a non-homogeneous reflection and scattering of light rays. This results in areas of dense opacity and saturation of color giving dentine