

Introduction

Transparency

The appearance of a transparent product is defined by its application. Packaging film used in the food industry should be very clear and transparent, while film for grocery bags should be translucent and diffuse the light. Therefore, different raw materials are selected and processed under certain conditions.

The absorption and scattering behavior of the transparent specimen will determine how much light will pass through and how objects will appear through the transparent product.

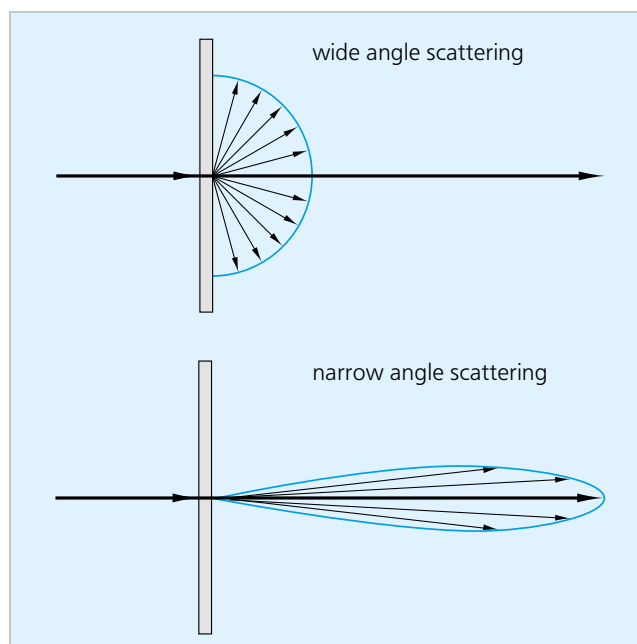
Total Transmittance

Total transmittance is the ratio of transmitted light to the incident light. It is influenced by the absorption and reflection properties, e.g.:

Incident light	100 %
– Absorption	-1 %
– Reflection	-5 %
Total Transmittance	= 94 %

The totally transmitted light consists of the directly transmitted and the diffused components. Depending on the angular distribution of the diffused portion, a transparent plastic will appear differently.

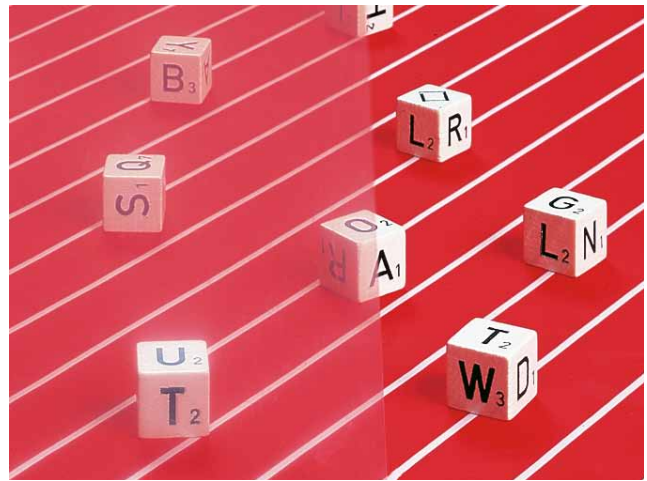
Visual perception can clearly differentiate two phenomena: Wide angle and narrow angle scattering.



TRANSPARENCY

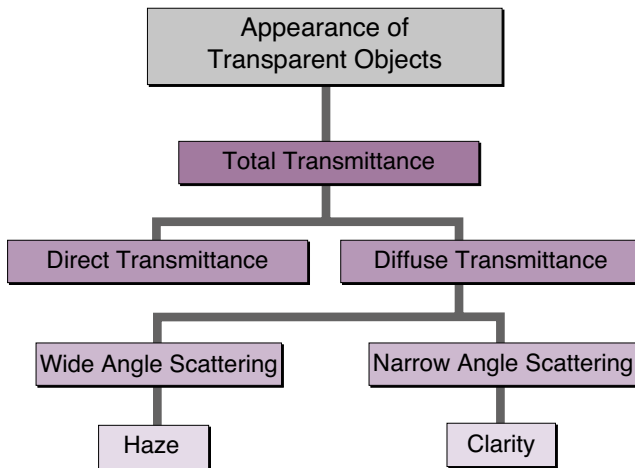
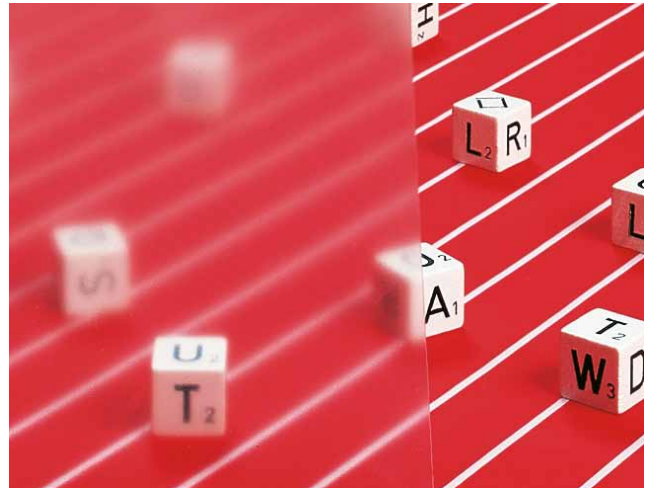
Wide Angle Scattering → Haze

Light is diffused in all directions causing a loss of contrast. ASTM D 1003 defines haze as that percentage of light which in passing through deviates from the incident beam greater than 2.5 degrees on the average.



Narrow Angle Scattering → See-through Quality

Light is diffused in a small angle range with high concentration. This effect describes how well very fine details can be seen through the specimen. The see-through quality needs to be determined in an angle range smaller than 2.5 degrees. Measurement and analysis of haze and see-through quality guarantee a uniform and consistent product quality and help analyze influencing process parameters and material properties, e.g. cooling rate or compatibility of raw materials.



Objective Measurement of Transparency

The figure on the right hand side shows the measurement principle of the haze meter: A light beam strikes the specimen and enters an integrating sphere. The sphere's interior surface is coated uniformly with a matte white material to allow diffusion. A detector in the sphere measures total transmittance and transmission haze. A ring sensor mounted at the exit port of the sphere detects narrow angle scattered light (clarity).

