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Blurring the Line: Polymers and Optics[1]

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Aesthetic considerations are critical in the development of consumer products. Aesthetic defects can be "lines" caused by the merging of melt flows in an injection molding process or scratches on an automotive surface or patterns on the light guide in a computer display which may affect uniformity of the image on the screen. It is often unproductive or impossible to eliminate these defects entirely. However the defect needs to be minimized to below a "threshold" of acceptability for the consumer. Understanding the optics of a defect and its effect on human perception is critical for designing consumer products. In this talk we present the optical parameters that govern "perception" of defects such as scratches or "lines," their relationship to physical parameters of the defect and the implications on polymer design. The sharpness of the optical contrast between the defect and its surroundings will be presented as the metric for "visibility." Empirical models between perceived visibility and defect physical dimensions will be presented as a basis for understanding the desired deformation characteristics of a material under stress. In addition we will discuss the intrinsic optical characteristics and the surface roughness of the product as important parameters in defect perception.

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