A Method to Determine Diffusion Particle Properties for Use in Optical Simulation

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THE CHALLENGE

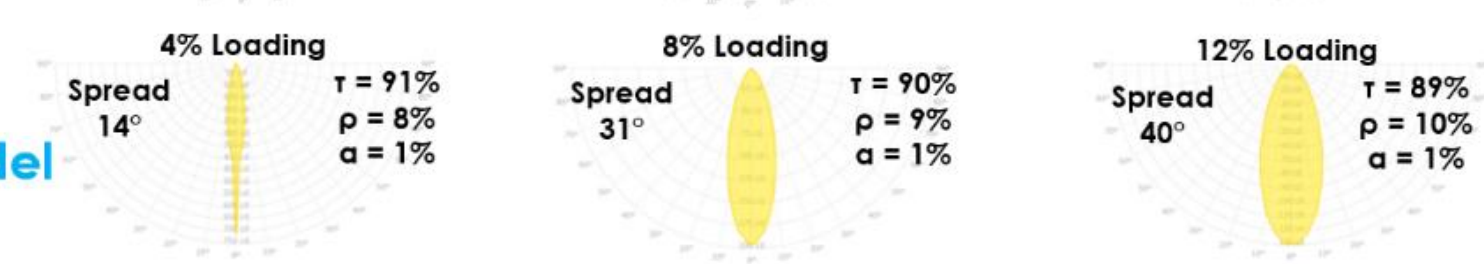
Milky white plastics are commonly used in illumination optics to provide a desired beam spread and light source hiding. Material manufacturers keep the data on the diffusion particles proprietary, which makes optical simulation of these particles at arbitrary density and part geometry impossible. While it is possible to measure samples at 8% and 12% for example, there is no way to predict how 10.5% will perform in a part that ranges in thickness from 0.5 to 3mm.

Diffusion B Test Results

THE SOLUTION

Combining the measurement of 3 material samples at different densities along with a wide range of probable particle simulations allows one to determine scatter particle properties that most closely match the tested material, thus allowing a scattering model to be constructed of the material, allowing simulation at any particle density and part thickness.

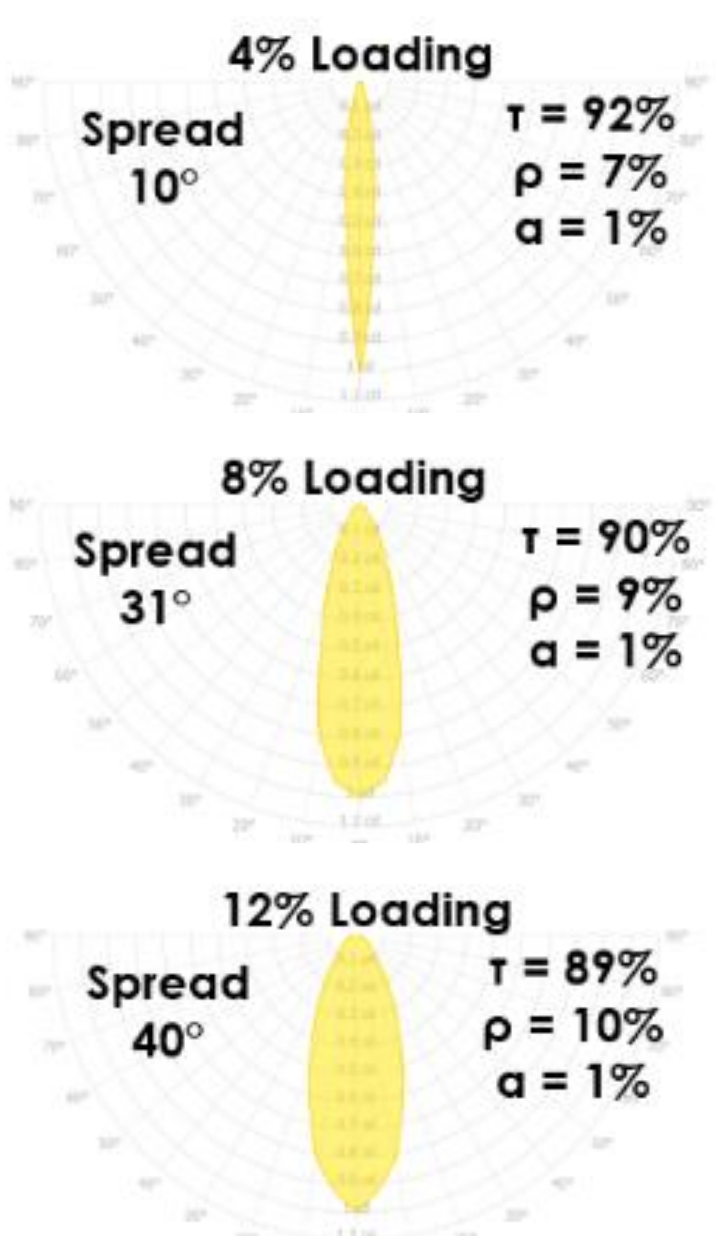
Diffusion B Simulation Model



THE PROCESS

Measure Scattering for 3 Reference Particle Densities

Scatter, reflectance, transmittance and absorption is measured for the material at 3 different known loading values, 4%, 8% and 12% in this example.

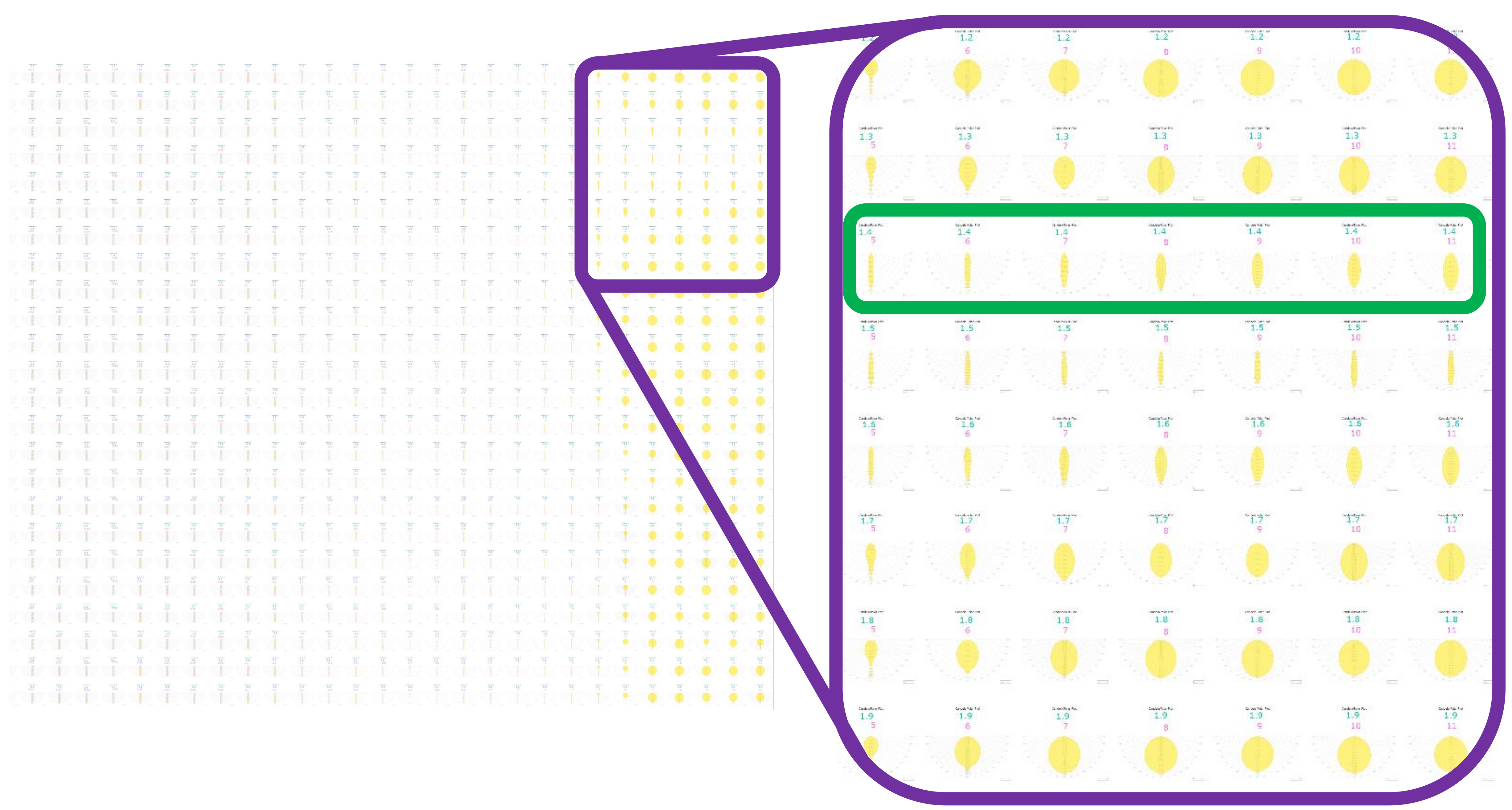


Simulate a wide range of possible scatter particles

A wide range of simulations is completed for scatter particles that have different properties, like index of refraction, shape, texture, and scatter coefficient.

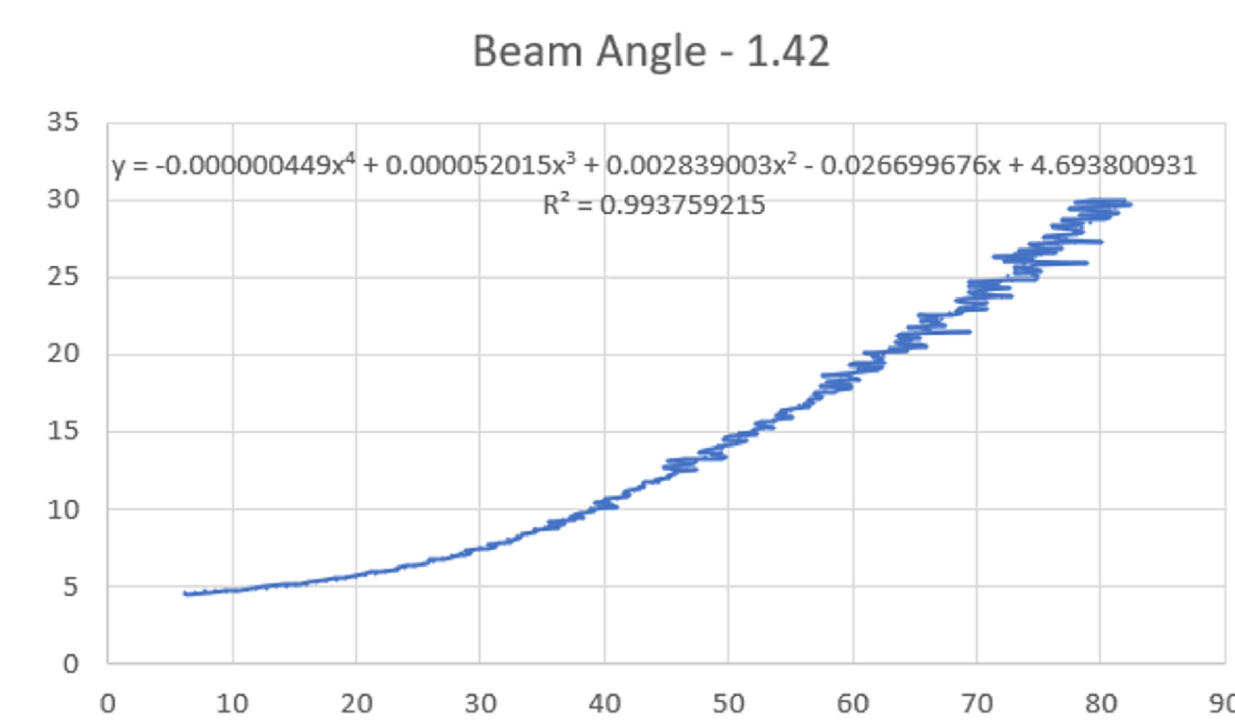
Identify Scatter Particle Type

A finer set of simulations is completed for the best scatter particle type match to cover a more precise range of variables.



Determine % Loading vs. Optical Model Parameters

From this set of data, regression fits are created to correlate the known % loading to optical modeling parameters such as scatter coefficient, index, shape, or texture. This allows the creation of a computational scatter model.



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