Diffraction, from Inconvenience to Physical Chemistry Tool

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Photothermal techniques are used routinely to measure absorption and refractive index in a medium, it is natural to extend its scope to include diffraction as a probing technique. The idealization of geometric optics makes it possible to form an image of an object where Gauss's law is fulfilled, and the image will be free of defects. Any departure from this idealization includes an optical path length modification, a specific phase description and an individual intensity pattern. The usual tool to describe diffraction starts with a scalar field picture and proceeds to the diffraction integral or the Fourier optics plus linear system description. The trigonometric function, the phase (ϕ) and the optical path length (nd), where n is the refractive index of the medium can change due to temperature, pressure and density, make an interesting combination, where the intensity in an image plane can be used to find the phase. We have been exploring correlation between intensity diffraction patterns from a laser beam passing for a sample with different pure materials, different mixed materials and different material dissolution and a strong correlation make identification possible, even conductivity measurement without contact is possible.

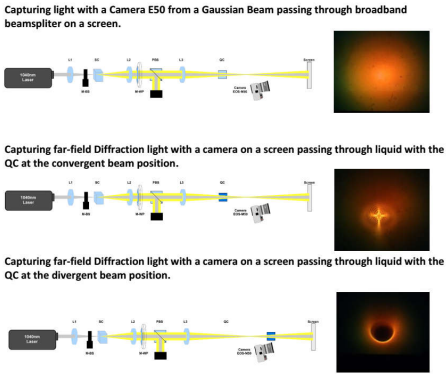

Figure 1: Different diffraction patterns