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Gaussian beams scattered from different materials

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Investigating spherical nano-particles by illumination of Gaussian beam was studied. In order to simulate the scattering effect new software simulation based on the Bromwich formulation and the Mie theory was developed. The scattering simulation enables us to examine the scattered field affected by the particle size and material composition. Studying the scattered fields yielded sensors configuration which has the ability to differentiate between particles made of different materials.

1. Introduction

Advanced technology quite frequently encounters the need to analyze particles and surface features in the nanometer region. The most important aspects of interest are the size and material composition. Since we deal with dimensions under the wavelength of light, conventional imaging has significant limitations and different approaches must be investigated. In this work we assess the possibilities to extract information about the material composition of spherical nano-particles by observing the distribution of the scattered intensity when the investigated particles are illuminated by a focused Gaussian beam.

Table 1
Mainly studied materials and their refractive index.

Material	Refractive index
Glass	1.5
Gold	1.658+1.956i
Poly-Si	5.298+0.843i
GaAs	4.434+2.052i
Aluminum	0.503+4.923i
Diamond	2.458

In order to simulate the scattering effect a simulation software was developed based on the Bromwich formulation and the Mie theory to yield the beam shape coefficients (BSC). Analyzing the interaction of the beam with a sphere using the BSC method enables us to