New perspectives on light scattering by particles of arbitrary morphology

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We present a comprehensive description of light scattering by particles of arbitrary morphology and refractive index. Application of $Q$-space analysis to the angular scattering functionality of light scattered by particles of wide variety of size, complex refractive index, shape and morphology uncovers a number of features common to all these situations. These features include a $q$-independent, hence angle-independent, forward scattering lobe in which at least half the scattered energy is found, then, with increasing $q$, a Guinier regime indicating the overall size of the particle, followed by a regime containing power laws in $q$, thereafter a “hump” regime, which varies with the imaginary part of the refractive index, and ending with complex rainbows and glories strongly dependent upon morphology and the complex index. For all shapes and morphologies these features evolve from the diffraction limit, i.e. the structure factor of the particle, with a single, size and refractive index dependent, universal parameter.

Mode of presentation: Invited