Spectroscopic, photometric, and polarimetric modeling of asteroid (4) Vesta

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We present a novel simulation framework for modeling the spectroscopy, photometry, and polarimetry of asteroid (4) Vesta. The spectral modeling is carried out by utilizing a SIRIS4 – a code that takes inhomogeneous waves into account and simulates light scattering by Gaussian-random-sphere particles large compared to the wavelength of the incident light [1,2]. The code uses incoherent input and computes phase matrices by utilizing incoherent scattering matrices [3,4]. In order to model Vesta's reflectance spectrum, we first derive the complex refractive indices of howardite mineral abundant on Vesta's surface. The derived values are then further utilized in SIRIS4 with a specific particle size distribution to obtain the final spectrum. We also model Vesta's photometric phase curve and, with the same model, explain the observed opposition effect and negative linear polarization.

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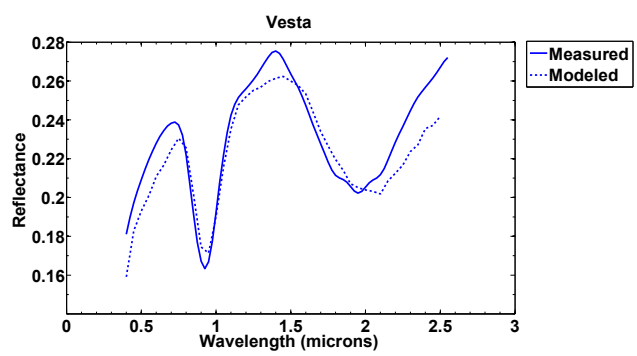

The measured and modeled reflectance spectrum of (4) Vesta at 15-degree phase angle.

References

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