About the artificial zero-order rainbow and its polarization

Florea S. ULIU

Department of Physics 1, University of Craiova, Str. A. 1. Cuza 13, Craiova-1100, Romania, tel. and fax 051-415077

ABSTRACT

In his Optiks, without proof, Newton asserted that a zero-order rainbow exists, one associated with two refractions and no internal reflection. Unfortunately, such a rainbow is never seen in Nature and the conclusion was that this rainbow does not exist. However, a zero-order rainbow angle may be defined as the relative minimum angle of deviation of geometrical light rays transmitted without internal reflection through a spherical water droplet, when the point source of light is closer to the sphere than its paraxial focal point. For such situations we determinate the degree of polarization of emergent light. In contradistinction to the first order-rainbow with a very high degree of polarization, the zero-order rainbow is nearly not polarized.