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A simple method for the refractive index and dispersion measurements of transparent materials by transmissivity

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Abstract: We present a simple method of simultaneous measuring of the refractive index and dispersion for transparent materials over a wide wavelength region from 430nm to 660nm. It is mainly composed of the broadband illuminating source of stable incident light intensity and spectrometer with CCD detector. In order to verify a reliable and appropriate performance of measurements of the present method, sapphire and K9 glass were used as the samples to test the method. The measuring results show that present method is in agreement with the minimum deviation method. It validates the feasibility of present technique.

Key words: Refractive index; dispersion; transparent material, transmissivity

1. Introduction

The refractive index of material is one of the most important optical parameters in bulk glass or crystal optical designs [1], waveguide designs [2], and nonlinear effect analysis for high power pulsed laser systems [3]. The refractive index of a substance is a dimensionless parameter that is a fundamentally important property describes how light speeds are reduced in the material with respect to their vacuum values. It represents the response of the electronic charge distribution to the disturbance brought about by the electric field component of incident electromagnetic radiation. Many traditional measuring methods of the refractive index, such as based on the minimum deviation method (MD) and Snell's law for the determination of refractive index of various materials up to the second to fifth decimal and have several limitations[4-8]. The shape of material must be fabricated triple prism form, and the apex angle and the flatness of the plane surface are high accuracy by MD method. Refractometer is used to determine the critical angle. In such apparatus, the essential part is a prism of known refractive index in contact with the liquid to be examined [5]. If the refractive index is higher than 1.70, the Refractometer can not be used because it is limited by the

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