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Real-time holographic refractometer for liquid analysis, Eduardo A. Barbosa, , Danilo M. da Silva, André O. Preto, *Faculdade de Tecnologia de São Paulo*, Niklaus U. Wetter, *Centro de Lasers e Aplicações - IPEN* ■ In this paper the development of a holographic refractometer for liquid analysis illuminated by multimode diode lasers is presented. In the reference-beam path the glass test cell was positioned and through the object-beam arm a tilted metallic plate was imaged. Due to the multi-wavelength character of the laser emission a synthetic wavelength is obtained and the image of the object is modulated by contour interference fringes. A change ΔL on the liquid column length corresponds to Δp running fringes on the object image, and from this relation the refractive index of the test liquid was obtained. A sillenite photorefractive $Bi_{12}TiO_{20}$ (BTO) crystal was employed as the holographic medium whether using a single multimode diode laser or by combining two diode lasers. In the latter configuration the measurement sensitivity can be enhanced and the analysis of turbid liquids is allowed by properly selecting the synthetic wavelength. In both cases the lasers emitted at 665 nm. Through this technique the refractive indexes of ethanol/water mixtures with different concentrations were measured, as well as the NaCl concentrations in aqueous solutions were determined upon comparison with an empirical curve. In both cases the results were compared with the ones obtained through a commercial Abbe refractometer.

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Generation of multi-wavelength interferograms by volume holographic media for wavefront reconstruction, Eduardo Acedo Barbosa, *Faculdade de Tecnologia de São Paulo* ■ Three-dimensional wavefront reconstruction can be carried out through two-wavelength whole-field interferometry. The contour interference fringes are due to the intersection of the measured surface with parallel, equally spaced planes of constant elevation. In this work it has been studied both theoretically and experimentally the generation of such planes considering the illumination of a holographic interferometer by two laser beams. The beams with different wavelengths are originated from two tunable red diode lasers and propagate nearly in the same direction. The theoretical analysis described how the spatial frequency of the elevation planes and their angular position depend on parameters of the optical setup. Due to the thick $Bi_{12}TiO_{20}$ photorefractive crystal employed as the storage medium the Bragg selectivity of the holographic readout was also considered. For partially off-Bragg processes it has been shown that the direction of the constant elevation planes strongly depends on the wavelengths detune, on the angular difference between the propagation directions of the beams and on the illumination beam angle. For perfect Bragg regimes the planes present a constant angular position which depends only on the angle between the reference and the object beams at the holographic medium and on its refractive index. The calculated directions of the elevation planes as a function of the wavelength detune were satisfactorily confirmed by the experiments.