27p-G6-6

Development of a calibration method to obtain a complex electric field spectrum of samples from a time-domain tomography

Nagaoka Univ. of Tech., °Tuan Banh Quoc, Masaya Sakatsume and Tatsutoshi Shioda

E-mail: tshioda@vos.nagaokaut.ac.jp

Simultaneous measurement system for both tomographic images and spectrum of materials are required for the industries. In this report, we present an improvement of our previous calibration method[1] to obtain a complex electric field spectrum of a sample from the time-domain tomographic image which employed a low-coherence interferometer. The refractive index, its dispersion, and power reflectance of the sample were determined from the calibrated amplitude spectrum of the calibrated complex electric field. In addition, the optical length was obtained using a phase spectrum, which was obtained by Fourier transform of the spatially resolved image. Also, the geometric length of the sample was obtained using the refractive index and optical length. Figure 1 shows the schematic of our proposed technique. A collimated, low-coherence light source is divided into two optical paths by a non-polarizing beam splitter (NPBS). A reference beam is reflected by a reference mirror mounted on a precision stage. The precision stage is utilized using an optical linear encoder with a motorized stage so that long movable range, high resolution (in nanometer order), and the repeatability can be confirmed. A measurement beam is reflected from a sample of interest. The two beams are coupled by the NPBS and interfere. The interference signal is observed as a tomographic image by a photo detector (PD). A reference sample, whose characteristics were are measured by a commercial spectroscopy system, is used as the demonstration for our proposed system

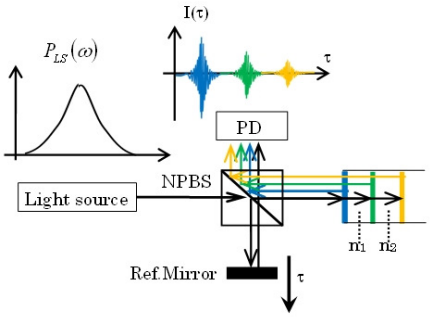

Figure 1: Schematic of the proposed system

[1] Masaya Sakatsume, Yukihiro Mikawa, Tuan Banh Quoc, Tatsutoshi Shioda, “Novel tomography of simultaneous imaging and material characterization by spatially-resolved spectroscopy”, JSAP Autumn meeting 2012, 12p-F8-4.