X-ray phase scanner using Talbot-Lau interferometry for non-destructive testing – II

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The X-ray Talbot and Talbot-Lau interferometers which are composed of transmission gratings and measure the differential X-ray phase shifts have gained popularity because they operate with polychromatic beams [1, 2]. A non-destructive testing in industrial field using these interferometers for continuous sample scanning is not yet completely revealed. A scanning setup is very often favorable when compared to a direct 2D image acquisition in terms of field of view, exposure time, illuminating radiation, etc. This research work demonstrates the feasibility of an X-ray phase sensitive scanner using laboratory X-ray source and Talbot-Lau interferometer for non-destructive testing. The details of developed phase scanner which is available for scanning a moving sample were reported previously [3].

The performance of phase scanner with Talbot-Lau interferometer configuration was tested using laboratory X-ray source by scanning a long moving sample (highlighter pen) at a speed of 5 mm/s and absorption, differential-phase and visibility images were generated by processing non-uniform moiré movie with our specially developed phase-measurement algorithm. The results (Fig. 1) implies successful feasibility of X-ray phase imaging using scanning setup for non-destructive testing in combination with a conveyer system.

This research work is supported by JST-SENTAN project.

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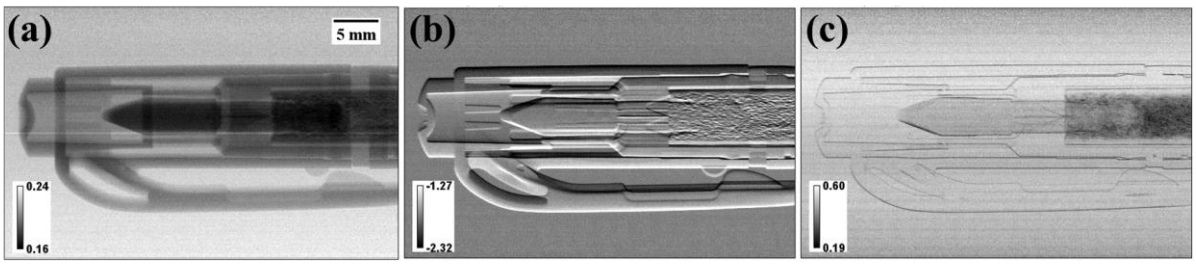

Fig.1: Observation results of a highlighter pen: (a) absorption image (b) differential phase image and (c) visibility image. The horizontal axis corresponds to the sample movement direction and was parallel to the grating lines.