

# Raman spectroscopy with an integrated arrayed-waveguide grating

**N. Ismail,<sup>1,\*</sup> L.-P. Choo-Smith,<sup>2</sup> K. Wörhoff,<sup>1</sup> A. Driessen,<sup>1</sup> A. C. Baclic,<sup>3</sup> P. J. Caspers,<sup>3</sup> G. J. Puppels,<sup>3</sup>  
R. M. de Ridder,<sup>1</sup> and M. Pollnau<sup>1</sup>**

*<sup>1</sup>Integrated Optical MicroSystems Group, MESA+ Institute for Nanotechnology, University of Twente,  
P.O. Box 217, 7500 AE Enschede, The Netherlands*

*<sup>2</sup>Institute for Biodiagnostics, National Research Council Canada, Winnipeg, Manitoba, Canada*

*<sup>3</sup>Center for Optical Diagnostics and Therapy, Department of Dermatology, Erasmus-University Medical Center Rotterdam*

*\*Corresponding author: N.Ismail@ewi.utwente.nl*

Received August 1, 2011; revised September 23, 2011; accepted October 20, 2011;  
posted October 27, 2011 (Doc. ID 151976); published November 28, 2011

An integrated arrayed-waveguide grating fabricated in silicon-oxynitride technology is applied to Raman spectroscopy. After its validation by reproducing the well-known spectrum of cyclohexane, polarized Raman spectra are measured of extracted human teeth containing localized initial carious lesions. Excellent agreement is obtained between the spectra of healthy and carious tooth enamel measured with our integrated device and spectra recorded using a conventional Raman spectrometer. Our results represent a step toward the realization of compact, hand-held, integrated spectrometers, e.g. for the detection of dental caries at an early stage. © 2011 Optical Society of America

*OCIS codes:* 130.7408, 170.5660, 300.6190.