

## Salinity measurement in water environment with a long period grating based interferometer

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**Abstract.** In this work, a comparative study of the behaviour of an in-fibre Mach–Zehnder interferometer for salinity measurement in a water solution is presented. The fibre transducer is composed of two nearly identical long period gratings forming an in-series 7.38 cm long device written in the same fibre optic. Two inorganic and one organic salts (NaCl, KCl, NaCOOH) were characterized within the concentration range from 0 to 150 g L<sup>-1</sup>. For the long period grating interferometer, the average obtained sensitivities were  $-6.61$ ,  $-5.58$  and  $-3.83$  pm/(g L<sup>-1</sup>) for the above salts, respectively, or equivalently  $-40.8$ ,  $-46.5$  and  $-39.1$  nm RIU<sup>-1</sup>. Salinity measured by means of fibre refractometry is compared with measurements obtained using an Abbe refractometer as well as via electrical conductivity. For the long period grating refractometer, the best resolutions attained were 1.30, 1.54 and 2.03 g of salt per litre for NaCl, KCl and NaCOOH, respectively, about two times better than the resolutions obtained by the Abbe refractometer. An average thermal sensitivity of 53 pm °C<sup>-1</sup> was measured for the grating transducer immersed in water, indicating the need for the thermal correction of the sensor. Resolutions for the same ionic constituent in different salts are also analysed.

*Keywords:* salinity, cascaded long period grating, environmental measurement

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