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Application note

Measurement of concentration of NH_3 in aqueous environment using integrated Rocket ATR spectrometer

Introduction

The Arcoptix OEM-ATR-20-12 spectrometer is an ATR (attenuated total reflection) version of the Arcoptix very successful range of spectrometers, adapted for measurements of liquids. This Application note is documenting the use of this spectrometer for measurement of diluted CO2 in water.

Method

A 24% initial solution of NH_3 in water has been purchased. The solution was then sequentially diluted following a geometrical sequence with a factor of ½. The final concentration in the sequence of measurements is in the range of 117 ppm.

Procedure:

(1) The background spectrum was measured with degassed deionized water on the crystal, integrating individual 256 spectra with the resolution of 2 cm^{-1}.
(2) The ATR crystal was then dried, and the sample was deposited using a micro-pipet.
(3) The sample was left to stabilize for 1 minute and a spectrum integrating 256 spectra was taken in absorbance mode.
(4) The recorded spectra were then investigated at 1101 cm^{-1}, where the maximum Absorbance of the diluted NH_3 is located.

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Results

(1) The detail of the absorption peak corresponding to the dissolved NH_3 for 1101 wavenumbers plotted for the variety of the concentrations is shown below.

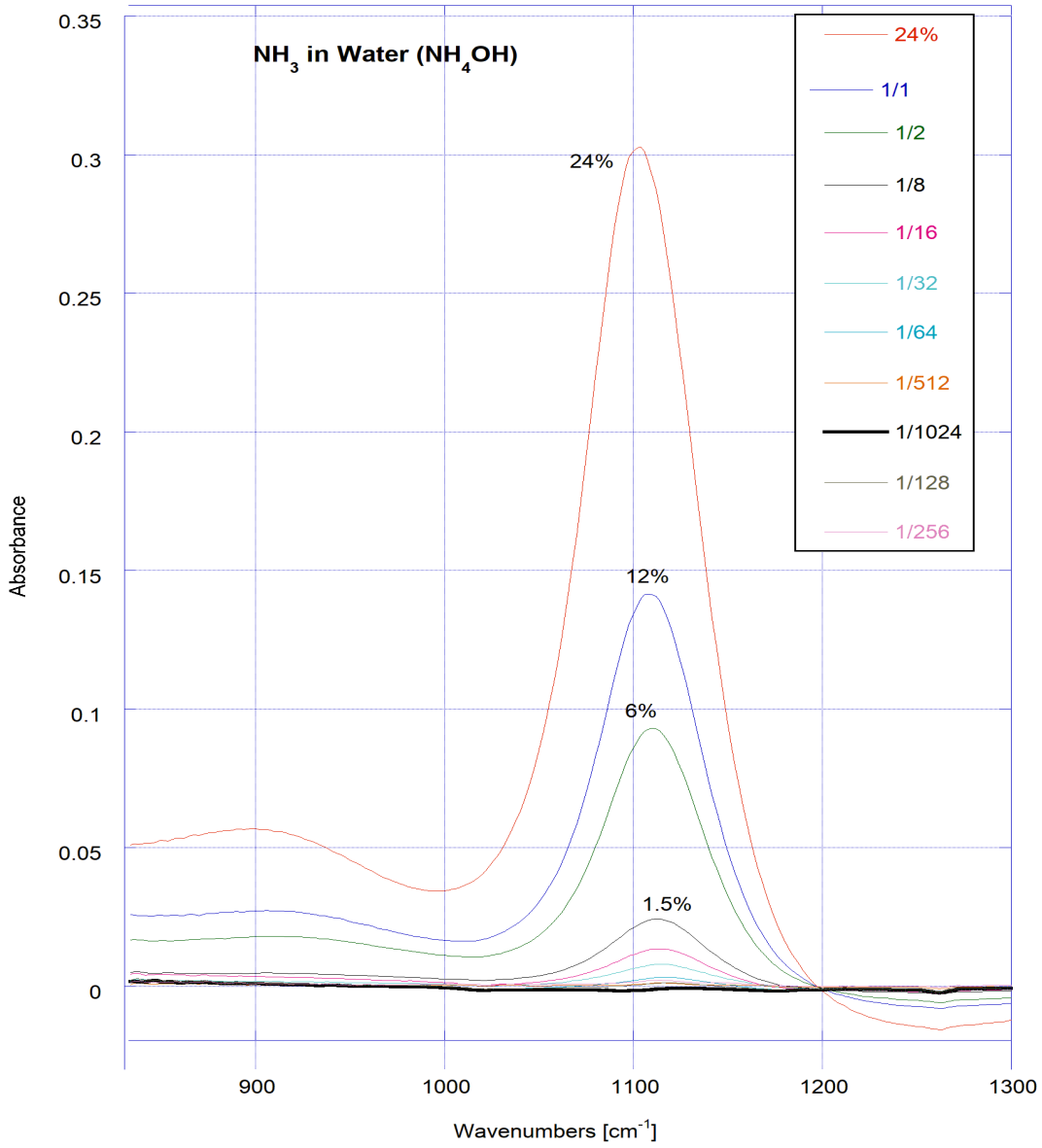

Figure 1 – CO2 in water for various concentrations the dilution follows a geometric sequence with a factor of 0.5.

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(2) A more detailed plot for the part of lower concentrations is shown below.

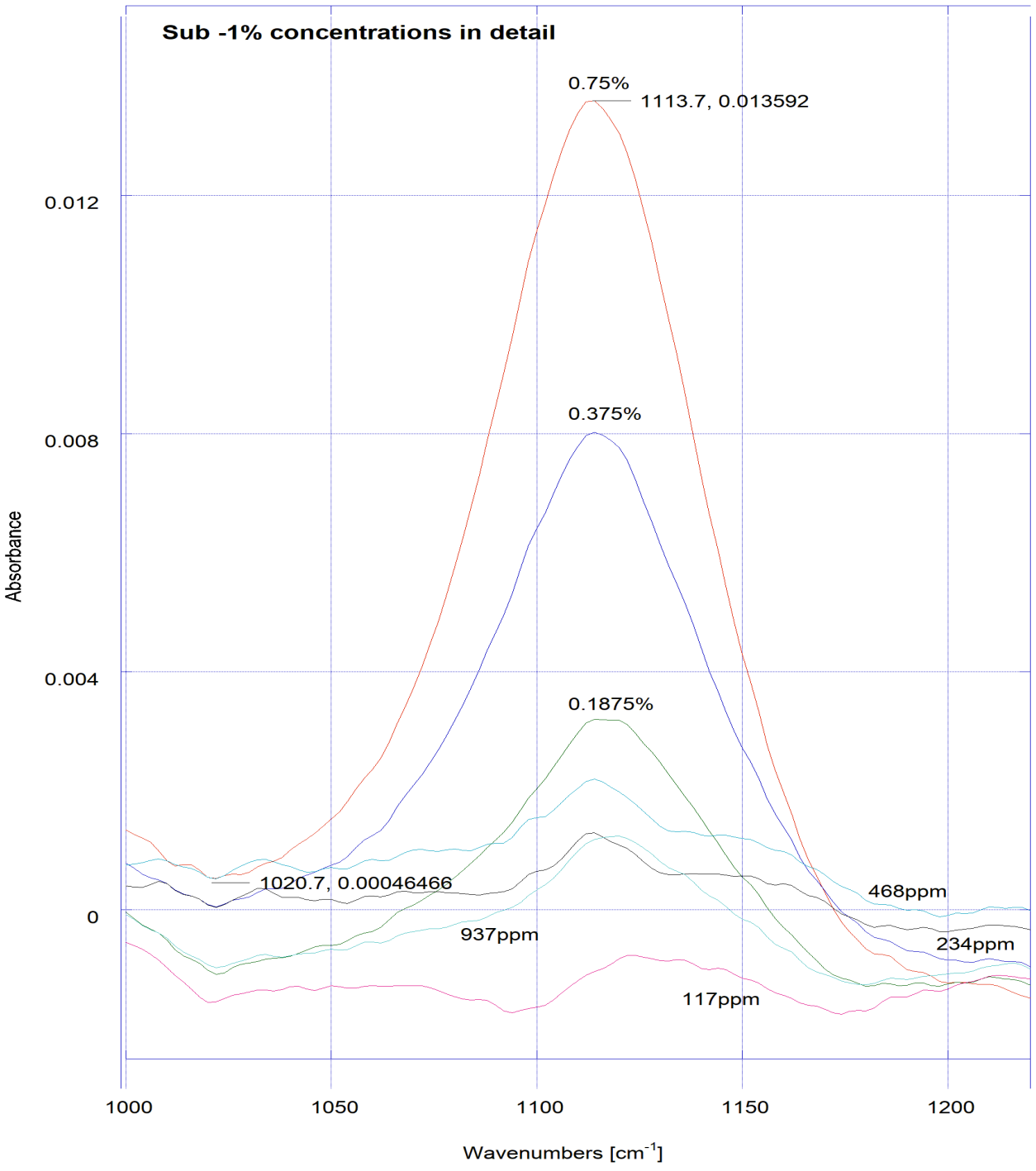

Figure 2 – Detaoled plot for lower concentrations

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(3) The sensitivity evaluation. For simplicity only the maxiam of the asorbance signal with respect to the concentration at the 1101 wavenumbers have been plotted. With this respect the sensitivity of this method in the level of 1.1 e-06 of absorbance per ppm have been detected in the vicinity of the zero point (four lowest points have been line-fitted, and the slope has been evaluated). The LOD and LOQ determination would require more data in the dataset to be evaluated.

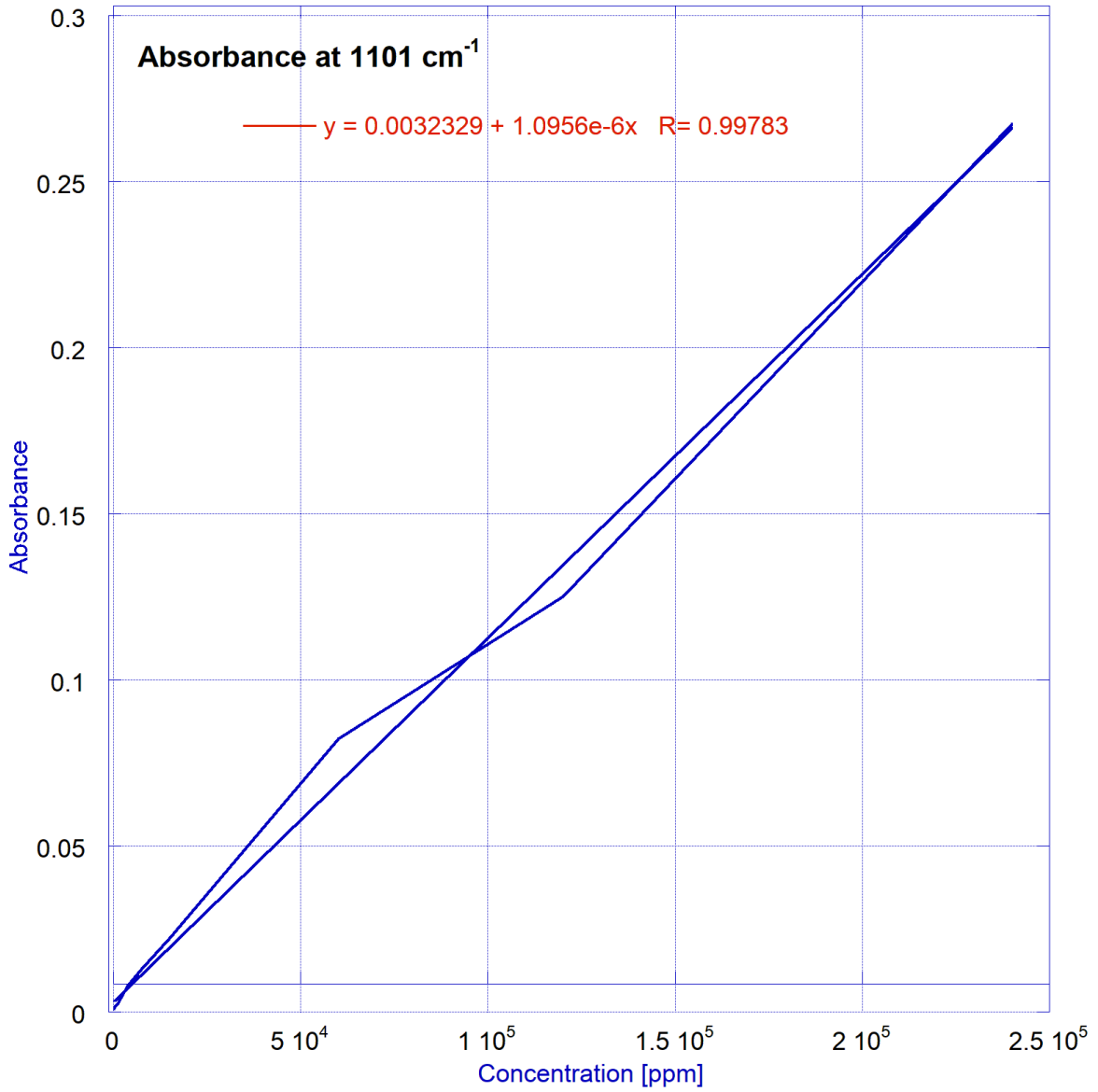

Figure 3- >Evaluation of the sensitivity of OEM- ATR-20-12 model for binary mixture of Ammoniac in water.

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Conclusion.

The OEM-ATR-20-12 has been evaluated as a suitable tool for measurements of the diluted Ammoniac in water on the 10 ppm level. Further – more sophisticated evaluation is to be performed to quantify the performance and to narrow down the margins of the precision.