

Analytical Data Sheet for ANDalyze Lead Sensor

Detection of lead in drinking water

2 – 100 ppb

ANDalyze's proprietary Catalytic DNA sensor for lead uses a DNAzyme reaction that fluoresces in the presence of the target contaminant, lead. The fluorescence of the reaction is measured using the ANDalyze fluorimeter to determine the concentration of the free lead ion (Pb^{2+}) in solution and is reported in parts per billion (ppb).

Performance

Lead dilutions containing 0, 5, 10, 15, 25, 50, 75, 100, 150, 200 ppb Pb^{2+} were prepared in DI water. The Lead sensor kits and the ANDalyze fluorimeter were used to perform the lead test at each dilution (five replicates were made for each test).

Materials Used

ANDalyze Fluorimeter
Lead Sensor kit (Part Number: AND010)
Standard Lead Solutions

Limit of Detection (LOD)

1 ppb Pb^{2+}
Based on 3 sigma method

Limit of Quantification (LOQ)

2 ppb Pb^{2+}
Based on 10 sigma method

Linear Detection Range

2 – 100 ppb Pb^{2+}

Precision

Standard: 15 ppb Pb^{2+}
95% confidence limits: 13 – 17 ppb Pb^{2+}

Coefficient of Variation (CV)

0–200 ppb Pb^{2+} $\pm 15\%$ or 2ppb, whichever is greater

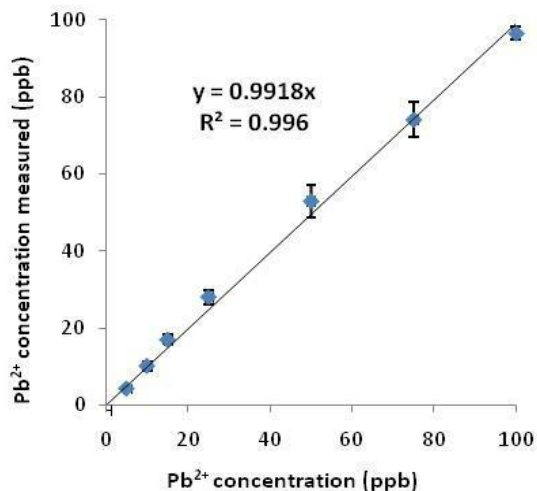
Note: This data is for tests in DI water. Environmental and other matrix variations will be higher.

All specifications are subject to change without notice.

Graphs

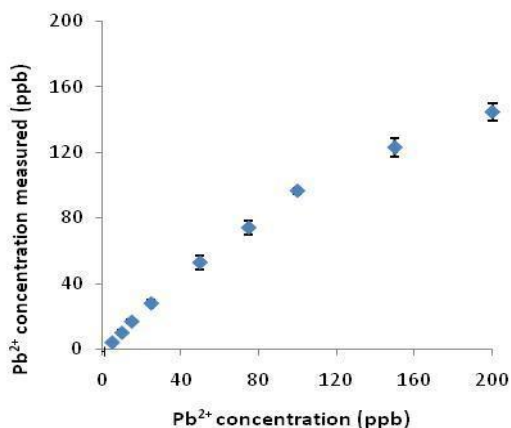
The plot depicts the average measured Pb^{2+} concentration as displayed on ANDalyze fluorimeter (y-axis) vs. the known concentration of the lead standards (x-axis). Error bars depict the standard deviation from five measurements.

Figure 1



Linear range is 0 - 100 ppb Pb^{2+} (Figure 1). For higher concentration of Pb^{2+} (tested up to 200 ppb Pb^{2+}), the accuracy decreases (Graph 2). Samples containing higher than 100 ppb Pb^{2+} maybe diluted 1:1 and re-analyzed. Note: The dynamic range is tunable (data not shown) and for application where higher lead concentrations (>100 ppb Pb^{2+}) are routinely tested custom protocols can be created.

Figure 2



Interference

Interference tests were done with a 30 ppb Pb^{2+} solution plus the potential interfering ion. The interference tolerance levels represent the concentration above which the lead concentration is changed to $\pm 10\%$. Data represents an average of at least three replicates. For each interference test, an on-site calibration with the particular water matrix (containing the interfering ion) was performed.

Interfering ion	Interference level
Calcium, Ca^{2+}	500 ppm
Magnesium, Mg^{2+}	500 ppm
Zinc, Zn^{2+}	100 ppm
Aluminum, Al^{3+}	0.1 ppm
Copper, Cu^{2+}	0.5 ppm
Iron, Fe^{3+}	0.04 ppm
Cadmium, Cd^{2+}	15 ppm
Mercury, Hg^{2+}	0.03 ppm
Manganese, Mn^{2+}	150 ppm
Ammonium, NH_4^+	2000 ppm
Carbonate, CO_3^{2-}	100 ppm
Phosphate, PO_4^{3-}	50 ppm
Chloride, Cl^-	2000 ppm
Sulfate, SO_4^{2-}	100 ppm
Nitrate, NO_3^-	5000 ppm

Temperature Range

ANDalyze test kits work when the sample is in the 17 – 35 °C (63 – 95 °F) temperature range. However, the most accurate and precise results are obtained if the sample is in the range of 20 – 25 °C (68 – 77 °F). A change in temperature of several degrees will require an on-site calibration to be performed.

Storage and Shelf Life

The shelf life is 1 year (12 months) from manufacture date for the sensors if stored in cool, dry area away from direct sunlight at temperature less than 23°C (73°F); however the shelf life of the product is limited by the liquid buffer supplied with the sensor kit which is only 6 months from manufacture date. The life of the liquid buffer can be improved if refrigerated/frozen for up to one year from manufacture date.