

Analytical Data Sheet for ANDalyze Uranium Sensor

Detection of uranium in drinking water

2 – 60 ppb

ANDalyze's proprietary Catalytic DNA sensor for uranium 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 free uranium (present as uranyl ion, UO_2^{2+}) solution and is reported in parts per billion (ppb) of uranium.

Performance

Uranium dilutions containing between 0 - 100 ppb of uranium were prepared in DI water. The Uranium Sensor Kits and the ANDalyze Fluorimeter were used to perform the uranium test at each dilution (five replicates were made for each test).

Materials Used

ANDalyze Fluorimeter
Uranium Sensor Kit (Part Number: AND011)
Standard Zinc Solutions

Limit of Detection (LOD)

1 ppb uranium
Based on 3 sigma method

Limit of Quantification (LOQ)

2 ppb uranium
Based on 10 sigma method

Linear Detection Range

0 – 60 ppb uranium

Precision

Standard: 30 ppb uranium
95% confidence limits: 25 – 35 ppb uranium

Coefficient of Variation (CV)

0–80 ppb uranium $\pm 15\%$ or 2ppb, whichever is greater

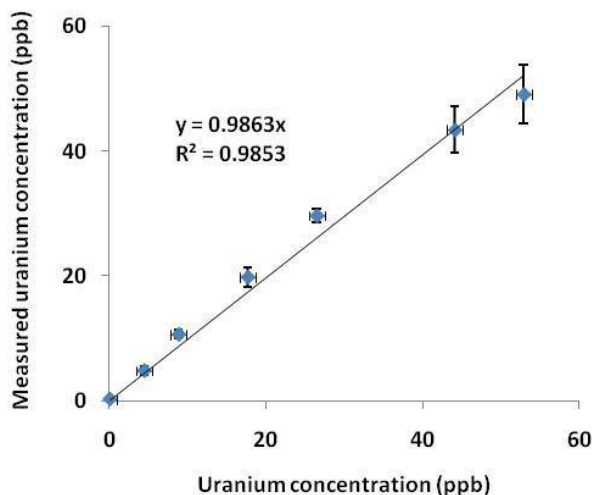
Note: This data is for tests in DI water. Environmental and other matrix variations will be higher.

All specifications are subject to change without notice.

Graphs

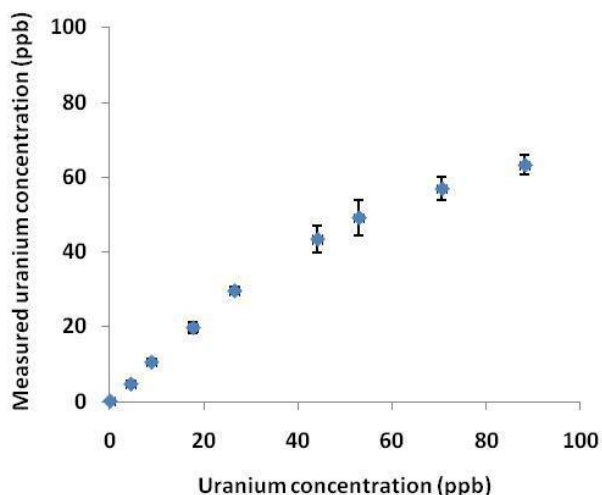
The plot depicts the average measured uranium concentration as displayed on ANDalyze fluorimeter (y-axis) vs. the known concentration of the uranium standards (x-axis). Error bars depict the standard deviation from at least five measurements.

Figure 1



Linear range is 0 - 60 ppb uranium (Figure 1). For higher concentration of uranium (tested up to 90 ppb uranium), the accuracy decreases (Graph 2). Samples containing higher than 60 ppb uranium maybe diluted 1:1 and re-analyzed. *Note: The dynamic range is tunable (data not shown). For application where higher uranium concentrations (>100 ppb uranium) are routinely tested, custom protocols can be created.*

Figure 2



Interference

Interference tests were done with a 30 ppb uranium 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+}	1000 ppm
Magnesium, Mg^{2+}	375 ppm
Zinc, Zn^{2+}	30 ppm
Aluminum, Al^{3+}	0.05 ppm
Copper, Cu^{2+}	2 ppm
Iron, Fe^{3+}	0.3 ppm
Cadmium, Cd^{2+}	5 ppm
Mercury, Hg^{2+}	30 ppm
Manganese, Mn^{2+}	0.025 ppm
Ammonium, NH_4^+	1000 ppm
Carbonate, CO_3^{2-}	50 ppm
Phosphate, PO_4^{3-}	5 ppm
Chloride, Cl^-	500 ppm
Sulfate, SO_4^{2-}	200 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.