SOLVITA THIN-LAYER GEL CHEMISTRY AND QC

SOLVITA®

TECH MEMO 0020-#15

SOLVITA QC MANAGEMENT – ENHANCING ANALOG CHEMISTRY

Solvita is used widely for determining CO_2 release from soils and composts. Its unique thin-layer gel results from a tightly controlled GMP manufacturing process. The result is an optical chemistry system that is remarkably sensitive combined with simplicity, safety and accuracy. This lends its usefulness in schools, for field ecology and labs. We've published results showing that with the digital color reader Solvita furnishes a level of accuracy comparable to GC and IR methods[1] [2]. This memo describes some facts behind the chemistry and the new and enhanced QAQC measures used for production and handling to increase reliability.

Fig 1 Solvita thin-layer gels in high-tech GMP mfg.

Solvita is a form of colorimetric CO_2 detection first reported in Germany in the 60's as a substitute for base-trap methodology. It was first commercialized by Solvita with discovery of NaOH-Borate thin-layer gel chemistry. These gels are the analog equivalent to a digital signal, providing an elegant and continuous response to CO_2 across a fairly wide and definable range of CO_2 concentration.

Figure 2 shows a high-resolution spectrometric scan of a Solvita CO_2 gel exposed to increasing levels of CO_2 produced by a soil sample. The optic response across varying wavelengths enables a fairly high differentiation capability for CO_2 levels from 0.04 to 3.0%.

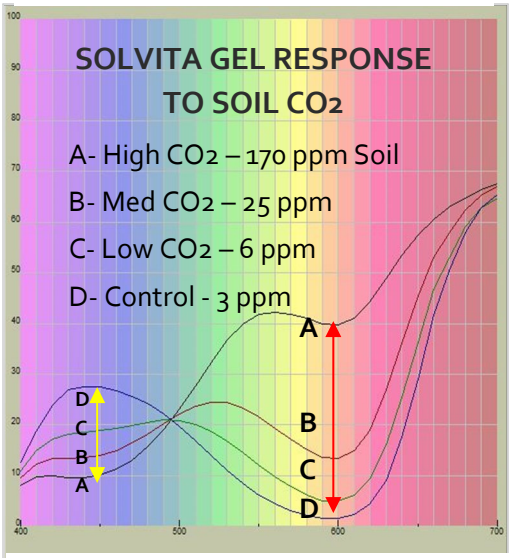

Fig 2 Scanning spectrometry shows Solvita gels respond continuously across a range CO_2 levels

As CO_2 increases from very low levels the gels undergo a rapid drop in absorption at 470 nm (blue) followed by a strong opposite response between 520 - 640 nm, as shown. We can achieve high resolution by exploiting these features differentially with our simple DCR. To enhance the reliability of the optic detection, in 2020 we initiated a 3-point calibration protocol – giving users assurance of proper performance across a range typical of poor to great soils. When simulating low, medium and high-respiring soils the accuracy and precision fit a cube function of CO_2% with an r^2 of 95 – 99%.

Any soil analysis must distinguish sources of variability caused by the measurement technology versus sample handling. Biology tests are inherently more sensitive due to artifacts from lab processing.

Solvita has taken important R&D steps to address soil handling issues enabling the soil community to better understand dynamics of biology testing and to better and to more accurately attribute sources of variability. Solvita gels uniquely absorb CO_2 at a rate commensurate with slow micromolar production rates in soils. We believe this makes Solvita a very realistic choice for respiration in natural biological systems.

Cut and paste DOI into browser to retrieve article

[1] Brinton, W & Vallotton, J. 2019. Basis for Comparisons of Soil CO_2 Respiration Tests. Agric. Environ. Lett. 4:180053 (2019), doi:10.2134/ael2018.10.0053

[2] Brinton, W F. 2020. Laboratory Soil Handling Affects CO_2 Respiration, Amino-N and Water Stable Aggregate Results. Agri Res & Tech: Open Access J. 2020; 24(2): 556262. DOI: 10.19080/ARTOAJ.2020.24.556262