Xentaur Hyper-Thin-Film (HTF™) Aluminum Oxide Technology

Xentaur

Xentaur's breakthrough Hyper-Thin-Film (HTF™) Technology is based on major advances in thin-film technology and metal oxide sciences. It provides measurements with a sensitivity several orders of magnitude larger than of those made with all other technologies. HTF™ sensors are free of drift and insensitive to temperature changes over most of their range.

Operating Principle:

Xentaur's HTF™ and all other aluminum oxide sensors share the same basic operating principle: the capacitance measured between the sensor's aluminum core and a gold film deposited on top of the oxide layer varies with the water vapor content in the pores of the oxide layer. Three fundamental structural improvements in the oxide layer give Xentaur HTF™ sensors much increased sensitivity and stability: HTF™ sensors have much thinner oxide layer, a better defined barrier layer between the aluminum and the aluminum oxide and a unique pore geometry enhancing the entrapment of water molecules.

Hyper-Thin Layer:

With Xentaur's HTF™ technology, sensors can be produced with hyper-thin oxide layers without compromising insulation strength. The thinner oxide layer of HTF™ sensors results in much higher capacitance changes because capacitance is inversely proportional to the distance of the capacitor's plates from each other.

The thinner layer also means that water molecules will travel faster in and out of the pores. HTF™ aluminum oxide sensors therefore respond several times faster than conventional sensors.

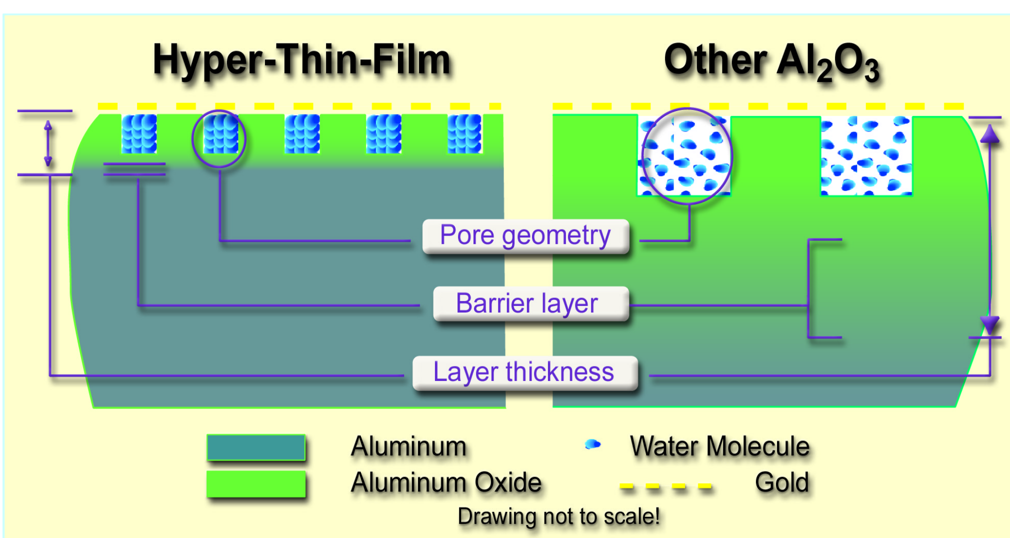
Barrier Layer:

In HTF™ sensors, the transition between the aluminum oxide and the aluminum is sharp and clearly defined. This thinner barrier layer produces a capacitor with its electrodes very close together, which in turn causes the sensor's wet to dry capacitance ratio to be high. The benefit of high wet to dry capacitance ratio is that drift in capacitance due to undesirable factors is less significant. This is clearly a benefit as can be seen in HTF™ vs. conventional sensor comparisons of temperature sensitivity and aging drift.

The sharp transition from aluminum to aluminum oxide also reduces metal migration, one of the major causes of aging drift in conventional sensors.

Pore Geometry:

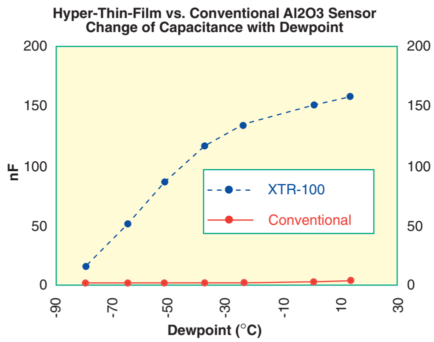
The most significant difference between HTF™ sensors and conventional sensors is, however, their pore geometry. While conventional sensors rely on hygroscopic aluminum oxide structures to attract water, HTF™ sensors rely on a pore geometry which slows the Brownian motion of the water molecules when entering the pores. The freed energy is absorbed by the mass of the sensor and the decreased entropy of the water molecules is equalized by an increase in their total number. This results in more dielectric in the pores and consequently a higher capacitance. The HTF™ pore geometry does not significantly change over time, while conventional hygroscopic aluminum oxide structures are not stable and collapse slowly into non-hygroscopic structures. Therefore, conventional sensors are subject to drift and need to be re-calibrated frequently, while HTF™ sensors need no re-calibration when used in clean, non corrosive gasses.

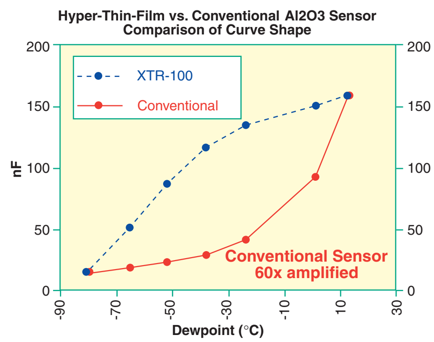


Xentaur Corp., 3661 Horseblock Road, Unit K, Medford, NY 11763, Tel.: (631) 345-3434 Fax.: (631) 345-5349 - email: xentaur@xentaur.com web: www.xentaur.com

Sensitivity:

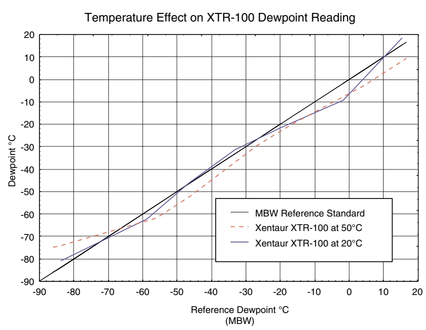
The change of capacitance with moisture of Xentaur HTF™ sensors over the full measurement range is 60 times larger than that of conventional sensors. However, because of the better linearity of HTF™ sensors, at the low end, capacitance changes with moisture are about 600 times larger than that of conventional sensors. The larger sensitivity of HTF™ sensors makes Xentaur HTF™ more stable and almost completely immune to other influences, such as temperature, electrical noise and even long term drift. It puts Xentaur HTF™ sensors in a league by themselves.

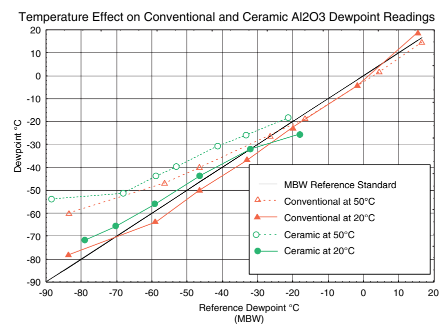




Temperature Coefficient:

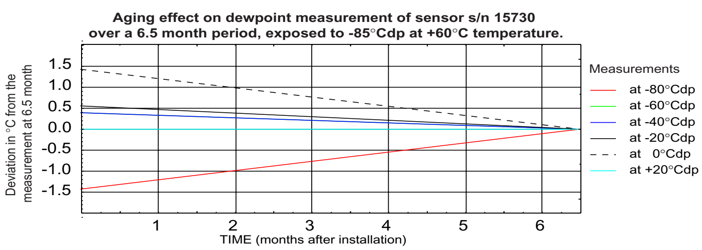
Xentaur HTF™ aluminum oxide sensors are completely temperature stable over almost their full range. Only below -70°C(dp) does the measurement become slightly temperature sensitive. Temperature coefficients remain small enough though, to allow for software compensation. The temperature coefficients of conventional and ceramic sensors relative to their sensitivity are too large to allow for an accurate compensation through software.





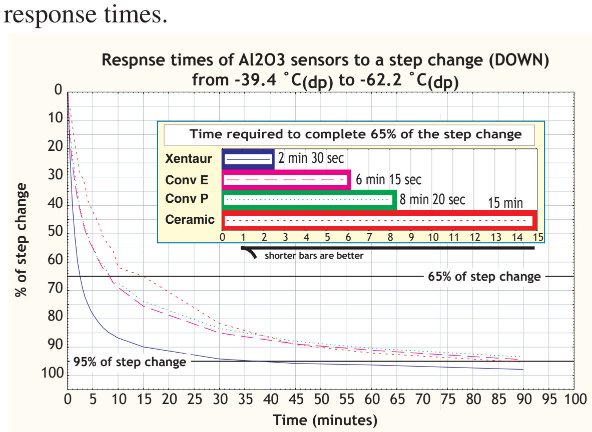
Drift:

Xentaur HTF™ sensors do not suffer from drift like conventional sensors. Their response curve remains virtually the same even after six month of operation at an elevated temperature.



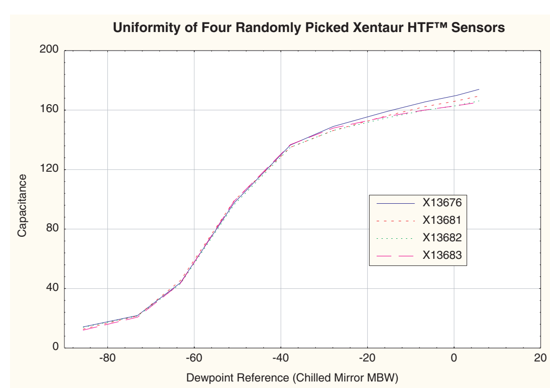
Speed:

The thinner oxide layer of HTF™ sensors results in much faster response times.



Uniformity:

Xentaur HTF™ aluminum oxide sensors can be manufactured with a high degree of uniformity. Sensors are freely exchangeable in the field with only minor adjustments required at the very extreme ends of the measurement range.



Xentaur Corp., 3661 Horseblock Road, Unit K, Medford, NY 11763, Tel.: (631) 345-3434 Fax.: (631) 345-5349 - email: xentaur@xentaur.com web: www.xentaur.com