Taken from Frost & Sullivan report D641, “Advanced in HVAC&R Technologies”

AdSem Inc. Develops World's Smallest Germanium NTC Thermistor—USA

Palo Alto, CA-based AdSem Inc. has reportedly developed the world’s smallest germanium (Ge) NTC thermistor, which has a size of 150 micrometers. Interestingly, Michael Kozhukh, president of AdSem Inc., tells *Technical Insights*, "When compared to companies that have been producing ceramic NTC thermistors with the same technology for years, AdSem Inc. has developed a novel technology for high-temperature semiconductor NTC thermistors and started their production. As a resultant of our years of expertise in this field, we have been able develop silicon (Si) and germanium (Ge) NTC thermistors, based on proprietary, patent-pending technology, that provide a plethora of advantages."

Si and Ge high-temperature NTC thermistors have better performance and are more cost-effective than the typical ceramic NTC thermistor. They have higher sensitivity, higher operational temperature, wider temperature range of interchangeability; their resistance-temperature dependence is universal, they can be produced with smaller sizes, they don’t interact chemically with moisture; they can be packaged at semiconductor packaging factories in high volumes with high productivity.

AdSem’s Si and Ge NTC thermistors can be very well employed in HVAC&R. As mentioned before, these products can replace ceramic thermistors in any application including HVAC&R. Si and Ge NTC thermistors have several advantages over ceramic thermistors that allow to simplify thermistor use or to use them in applications where ceramics does not work. For example, Si and Ge do not interact with moisture, which is a real problem for ceramic NTC thermistors. As a result, the developed thermistors can work in high-humidity environment and that improves accuracy of temperature measurement.

For applications such as HVAC&R, the company has developed thermistor probes (that can be stiff or flexible) with a number of surface mounted semiconductor thermistors. Several thermistors spaced apart on a probe surface allow measuring temperature distribution with high accuracy over large areas. Other examples that semiconductor NTC thermistors can be beneficial for HVAC applications could be their extended maximum operating temperature (up to 500 degrees C) and their extended interchangeability temperature range (from 70 degrees C for ceramic NTC thermistors to 500 degrees C for Si NTC thermistors).

Currently, AdSem produces and sells Si and Ge NTC thermistors for any temperature between 10 mK and 500 degrees C. The most popular applications are different high-temperature measurements. The company expects their high-temperature semiconductor NTC thermistors to replace ceramic NTC thermistors. In the future, AdSem Inc. aims to develop novel NTC and PTC semiconductor thermistors with extended upper temperature range of 1000 degrees C. Kozhukh says, "These developments depend on the speed of our growth, but for sure, it will happen in a few years because of obvious technical and price advantages of our Si and Ge high temperature NTC thermistors in comparison with ceramic NTC thermistors."

Interestingly, sensitivity to cost is the biggest driver for sensor industry and development of new sensing techniques augments significant performance and cost benefits, and can open up new applications, which would eventually displace existing technologies.