

BERGQUIST APPLICATION NOTES

Measurement of Thermal Conductivity in Compliant Low Modulus Materials

Bergquist has modified the ASTM D5470 standard test method to accurately test the thermal conductivity of soft, compliant elastomeric materials. Bergquist compliant material comprises the Gap Pad family.

Issue: ASTM D5470 specifies the use of 500 psi clamping pressure to coalesce layers of harder, higher modulus elastomeric materials together to eliminate the interfacial thermal resistance between the layers. The standard also assumes insignificant compression deflection of the test material at 500 psi. With this assumption, the thickness measurement of the material under test, used in the calculation of thermal conductivity, is made in the “as received” condition. With soft, compliant materials, 500 psi deflects the material under test to a significantly thinner cross section. Using the “as received” thickness in this case results in an erroneous calculation of thermal conductivity.

Bergquist Solution: Modify the ASTM D5470 standard test method in two areas. The first modification would be to lower the clamping pressure to 10 psi. This assures coalescence of softer, compliant layers while minimizing the compression deflection of the material under test. Bergquist has accomplished this modification by installing a pressure regulator with accuracy to 1 psi.

The second modification is to measure the cross sectional thickness of the material under test during the course of the test. This in-process thickness measurement ensures that if the material is deflected during the test, that the actual thickness under test is measured. Bergquist has accomplished this by installing a drop micrometer onto the pressure cylinder shaft. The thickness of each test layer can then be accurately measured, recorded, and used in the calculation of thermal conductivity.

Bergquist is in the process of recommending a test method review of compliant materials with the ASTM standards committee.