Thermal Analysis & Rheology

THERMAL SOLUTIONS

COMPARISON OF ELASTOMERIC SHOCK MOUNTS (VIBRATION DAMPERS)

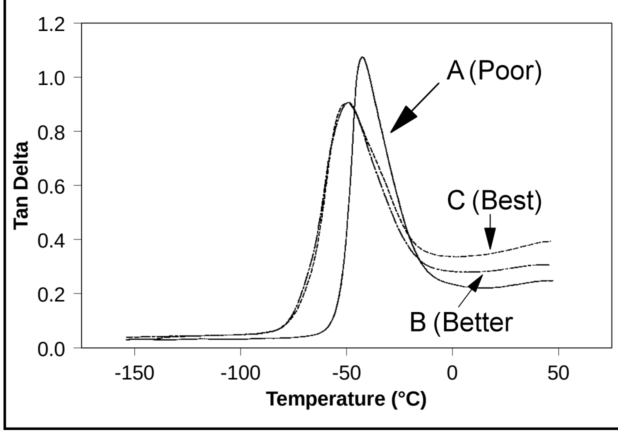
PROBLEM

Suppliers of materials used for shock mounts need to rapidly compare different materials with respect to their damping properties.

SOLUTION

Polymers used for applications such as shock mounts derive their favorable properties from internal molecular motions which "absorb and dissipate" the additional energy available during shocks (impacts). Dynamic mechanical analysis (DMA), which is a thermal analysis technique that measures the modulus (stiffness) of materials as well as their energy dissipation (damping) properties, is ideal for rapidly characterizing shock mount materials. Figure 1 shows the comparative DMA damping (tan delta) curves for three shock mount elastomers. All three exhibit a large damping peak in the range -50 to -30°C indicative of their glass transition temperatures (Tg). The Tg can be considered the lowest end-use temperature for damping applications. The results here clearly support that conclusion because tan delta is essentially zero below the Tg for all three elastomers. Material A has the highest temperature and sharpest glass transition damping peak, as well as the lowest damping level above the Tg. All these factors contribute to its poor performance in standard shock mount tests. Materials B and C, on the other hand, have lower temperatures, broader glass transition damping peaks, as well as reasonable damping above the Tg. Both perform well as shock mounts, Material C which has the highest damping above Tg performs best. Earlier studies have also shown that DMA damping results correlate well with conventional impact tests such as the ASTM Drop Weight Index method D-3029. [See Application Brief TA-130.]

Figure 1. DMA COMPARISON OF ELASTOMERS



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