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High temperature resonant ultrasound spectroscopy methods GUANGYAN LI, University of Mississippi, GARY LAMBERTON, General Electric Corporation, JOSH GLADDEN, University of Mississippi — Resonant ultrasound spectroscopy (RUS) is a technique to obtain the full elastic tensor of single crystal materials by measuring the mechanical resonances of a polished sample. Any direct resonance measurement at high temperatures is limited by the fact that most ultrasound transducers have an upper operational limit of 200-300C. High temperature RUS measurements are made possible by separating the sample, placed in a tube furnace, and the transducers with buffer rods made of low acoustic attenuation materials with good thermal stability such as ceramic alumina or fused quartz. Tests on stainless steel demonstrated that the system has the ability of acquiring resonance signals at temperatures up to 800C. Experimental issues such as additional resonance peaks introduced by the buffer rods and sample loading will be addressed. The apparatus has been used to study high temperature elastic properties of p-zintl thermoelectrics, single crystal quartz, a novel piezoelectric material kepertite, and the glass transition around 400C in bulk metallic glass compounds. Good results from these studies and high temperature test runs of aluminum and stainless steel demonstrate the potential for RUS measurements at elevated temperatures.

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