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High-Resolution ^{125}Te NMR of Novel Thermoelectric Materials
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— Several novel Te-based thermoelectric materials with extraordinary figure of merit $ZT \geq 1.4$ have been studied by high-resolution 25 kHz magic angle spinning ^{125}Te nuclear magnetic resonance (NMR) in order to investigate variations in composition on the nano-scale. A 20-fold wider ^{125}Te NMR signal of both $AgSbGe_4Te_6$ and $AgSbGe_{5.67}Te_{7.67}$ ($\sim$90 kHz) compared to that of PbTe (4.5 kHz) indicates a variation of shifts due to local composition fluctuations. The similar total shift of the main peak in $Ag_{0.53}Pb_{18}Sb_{1.2}Te_{20}$ (-1790 ppm) and PbTe (-1750 ppm) and similarly long T_2 relaxation time show that the majority of Te atoms in both materials has a similar environment. A second peak in $Ag_{0.53}Pb_{18}Sb_{1.2}Te_{20}$ at -1600 ppm shows the presence of a second type of Te site, accounting for $\sim$1/3 of all Te. These are apparently located in {Ag,Sb}-rich inclusions, as indicated by a much shorter T_2, which can be due to the effect of quadrupolar relaxation of ^{121}Sb or ^{123}Sb (spin 5/2 or 7/2, respectively) on ^{125}Te. Our data confirm suggestions made by Hsu *et al.,* Science (2004) and by Chen *et al.*, Appl. Phys. Lett. (2005) about the presence of nano-scale inclusions in $Ag_{0.53}Pb_{18}Sb_{1.2}Te_{20}$, which result in low lattice thermal conductivity and high ZT.

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