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Measurement of the Electric Field Gradient at ^{181}Ta in $ZrSiO_4$and $HfSiO_4$ using Perturbed Angular Correlation Spectroscopy HERBERT JAEGER, Miami University, SEAN MCBRIDE, University of Nebraska-Lincoln — Perturbed angular correlation spectroscopy (PAC) is a nuclear technique often used to probe the hyperfine interaction of a nuclear moment with extra-nuclear fields. For example the electric field gradient (EFG) at a ^{181}Ta probe nucleus in zircon ($ZrSiO_4$) depends on the arrangement of the Zr, Si, and O-atoms and is very sensitive to structural rearrangements. Our PAC experiments with zircon show that a very subtle rearrangement of Si-atoms within the unit cell leads to a change in the temperature dependence of the EFG. We are currently performing a series of PAC experiments on the isostructural hafnon ($HfSiO_4$). Preliminary results show no evidence of a similar structural rearrangement. In addition to the EFG, we also measure the anisotropy of the $\gamma\gamma$-cascade emitted during the decay of a ^{181}Ta nucleus. The measured anisotropy depends somewhat on the geometry of the sample and detector arrangement. However, with a given nucleus and a fixed geometry one would not expect a substantial change in the anisotropy during a series of measurements, say as a function of temperature. Yet our PAC spectra of zircon show a consistent decrease of the anisotropy in the temperature range between 650 and 800 $^\circ$C. Preliminary PAC spectra of hafnon show no change of the anisotropy. Reasons for this apparent loss in anisotropy will be discussed.

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