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**Detection of Electronic Defects in Zircon and Hafnon using PAC Spectroscopy**[1] HERBERT JAEGER, Miami University, SEAN MCBRIDE, Kansas State University — PAC spectroscopy is a nuclear technique for which a probe nucleus interacts with electric and magnetic fields due to extra-nuclear charges and spins. This interaction results in a precession of the nuclear spin, which in turn gives rise to a perturbation of the angular correlation of gamma rays that are emitted by the probes. This technique is well suited to detect phase transitions, but it is also very sensitive to dynamic processes, such as vacancy motion and electron trapping. We have used PAC spectroscopy to study phase changes upon annealing of radiation-damaged zircon as well as crystalline hafnon. Typical results of high-temperature measurements show periodic spin precession functions with little or no damping. At low temperature the amplitude of the spin precession function decreases indicating a smaller fraction of the probe nuclei being subject to the interaction prevalent at high temperature. We believe this is evidence of a trapped electronic defect, giving rise to a rapidly decaying high-frequency quadrupole interaction. At higher temperatures the defect detraps and no longer causes a reduction in the amplitude of the spin precession function.

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