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^{181}*Ta*-PAC Experiments with Zircon: The Case of the Lost Anisotropy HERBERT JAEGER, Miami University, SEAN MCBRIDE, University of Nebraska — 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 positions of the Zr, Si, and O-atoms and is very sensitive to structural rearrangements. In our PAC experiments with zircon we have shown that a very subtle rearrangement of Si-atoms within the unit cell leads to a change in the temperature dependence of the EFG.[1)] In addition to the EFG, we also measure the anisotropy of the emitted $\gamma\gamma$-cascade in our PAC experiments. The anisotropy is a nuclear property but, because of finite sample and detector size, it also depends somewhat on the geometry of the 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 800 and 650° C. We will discuss possible reasons for this apparent loss in anisotropy. [1)]H. Jaeger, K. S. Pletzke, and S. P. McBride, *Perturbed Angular Correlation Study of Naturally Occurring Zircon with Very Small Impurity Concentrations*, accepted for publication in Hyperfine Interactions (2005).

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