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Nuclear relaxation of N-state symmetric models[1] TYLER PARK, JEFFERY A. HODGES, CARLOS MORENO, MICHAEL STUFFLEBEAM, W. EVENSON, P. MATHESON, Utah Valley University, M.O. ZACATE, Northern Kentucky University — Nuclear relaxation of perturbed angular correlation (PAC) spectra offers insights to diffusion because it arises from motion of defects or of a nuclear probe in a crystal. The N-state symmetric model is a model of fluctuation among N symmetric electric field gradients (EFGs) experienced by a radioactive nuclear probe. By simulating the N-state symmetric model for various rates of hopping among the N EFGs, the resulting spectra can be fitted with a damped perturbation function, $G_{22}(t)$, or an exponential decay function to find the decay constant (λ). By plotting λ against the hopping rate, we find the maximum relaxation point. Fitting the raw spectrum, a spectrum weighted by error bars, and a spectrum with simulated errors gives a good indication of the relaxation that would be observed in a PAC experiment. The maximum relaxation point can then be used as an experimental measure of the defect or probe hopping rate, and hence the diffusion rate at that temperature. We report the results of our simulations and their implications, with potential applications to diffusion in intermetallic systems.

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