

Jump Frequency of Cd Tracer Atoms in β -Mn

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Diffusion has not been measured previously in β -Mn, which is stable between 655-1080° C and has a 20-atom unit cell with two inequivalent sublattices. De Doncker et al. showed for quenched β -Mn using perturbed angular correlation (PAC) that $^{111}\text{In}/\text{Cd}$ tracer atoms occupy the 12d sites and have a large electric field gradient (EFG). PAC measurements have been made by us at high temperature for pure β -Mn and alloys containing Al. Spectra exhibit nuclear quadrupole relaxation attributed to Cd atoms jumping among sites of the 12d sublattice (left figure). Each 12d atom has six 12d neighbors at distances of 0.26 nm, and the efg reorients by roughly 70° in each jump. Spectra were fitted to obtain jump frequencies w using the approximate relaxation model of Baudry and Boyer. At right are shown fitted jump frequencies, with the line corresponding to activation enthalpy 0.77(3) eV and prefactor $3.2(1)\times 10^{11}$ Hz. w is seen to be four times larger in pure β -Mn than in the alloys. The relationship between jump frequency and diffusivity will be discussed. *Supported by NSF grant DMR 00-91681.*

