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Composition dependence of the elastic constants of β and $(\alpha + \beta$p-phase PdH_x DOUGLAS SAFARIK, RICARDO SCHWARZ, STEPHEN PAGLIERI, DALE TUGGLE, ROBERT QUINTANA, Los Alamos National Laboratory — Previously [1], we measured the room-temperature elastic constants of PdH_x for $0 < x < 0.75$. These measurements were done on single crystals of α-phase Pd(H) solid solution ($x < 0.01$), of β-phase Pd-H hydride ($x > 0.62$), and of coherent two-phase mixtures of $\alpha + \beta$ phases ($0.01 < x < 0.62$). We found [1] that for all x the shear modulus C_{44} decreases linearly with x (Vegard law), whereas for $0 < x < 0.62$ the shear modulus $C' = (C_{11} + C_{12})/2$ shows a parabolic dependence on x. We attributed [1] this unusual composition dependence of C' to thermally activated anelastic relaxations of the coherent lenticular-shaped precipitates. If this explanation is correct, then the unusual behavior of C' should disappear on cooling to low temperature. In the present work we have measured the three independent elastic constants and internal friction for both the β-phase and the coherent $(\alpha + \beta$p-two-phase mixture in the temperature range $1.4 < T < 296$ K. We find that C_{44} for the $(\alpha + \beta$p single crystal follows a Vegard law irrespective of temperature. In contrast, C' shows deviations from the Vegard law, and these deviations grow with temperature. We discuss our results in terms of anelastic relaxations of the precipitates, and the elastic properties of two-phase composites. [1] Acta Mat. **53**, 569 (2005).

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