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Vibrational lifetimes of O-H stretch modes in MgO and ZnO ERIK SPAHR, GUNTER LUPKE, College of William and Mary, NORMAN TOLK, Vanderbilt University, LEONARD FELDMAN, Rutgers University — Hydrogen is an important and omnipresent impurity in a wide class of oxides. A more complete understanding of the role of hydrogen in wide-bandgap oxides such as MgO and ZnO is crucial for further development of oxide-based optoelectronics. We have measured for the first time the vibrational lifetime of the O-H stretch mode associated with the Mg^{2+} vacancy in MgO for the charge state, V_{OH}-, and the neutral state, V_{OH}, using picosecond transient bleaching spectroscopy. For the V_{OH} center we find the lifetime ($\sim$11 ps) is longer than for the charged defect state ($\sim$5 ps). These lifetimes are almost an order of magnitude shorter than in covalent semiconductors Si and Ge [1]. Similar measurements will be presented for interstitial hydrogen in ZnO. Our results provide new insight into the coupling of the ionic surroundings to the O-H vibration within the crystal lattice. [1] M. Budde et al., PRL 87, 145501 (2001).

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