Abstract Submitted for the MAR10 Meeting of The American Physical Society

Infrared Photon Stimulated Hydrogen Transport in Rutile TiO₂ ERIK SPAHR, GUNTER LUEPKE, College of William and Mary, LANLIN WEN, MICHAEL STAVOLA, Lehigh University, LYNN BOATNER, Oak Ridge National Lab, LEONARD FELDMAN, Vanderbilt University, Rutgers, NORMAN TOLK, Vanderbilt University — Measurements of the O-H and O-D vibrational lifetimes show that the room temperature proton diffusion rate in TiO₂ can be enhanced by 9 orders of magnitude when stimulated by resonant infrared photons. We find that the local oscillatory motion of the proton quickly couples to a wag-mode-assisted classical transfer process along the c-channel with a jump rate of >1 THz and a barrier height of 0.3 eV. Such an increase in proton transport rate at moderate temperatures is significant for renewable energy applications ranging from hydrogen transport membranes to water splitting by photocatalysis.

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Date submitted: 19 Nov 2009 Electronic form version 1.4