

Abstract Submitted  
for the MAR16 Meeting of  
The American Physical Society

**Electrical Mobility of Protons and Proton-Holes in Pure Water Characterized by Physics-Based Water Model.** BINBIN JIE, CHIH-TANG SAH, Department of Physics, Xiamen University, China — Pure water has been characterized empirically for nearly a century, as dissociation into hydronium ( $\text{H}_3\text{O}$ )<sup>1+</sup> and hydroxide ( $\text{HO}$ )<sup>1-</sup> ions. Last March, we reported that the ~40 year experimental industrial standard of chemical equilibrium reaction constant, the ion product, can be accounted for by a statistical-physics-based concentration product of two electrical charge carriers, the positively charged protons,  $\text{p}^+$ , and the negatively charged proton holes or proholes,  $\text{p}^-$ , with a thermal activation energy or proton trapping well depth of  $E_{\text{p}^+/\text{p}^-} = 576 \text{ meV}$ , in the 0-100°C pure liquid water. We now report that the empirically fitted industrial standard experimental data (1985, 1987, 2005) of the two dc ion mobilities in liquid water, can also be accounted for by trapping-limited drift of protons and proholes through proton channels of lower proton electrical potential valleys,  $E_{\text{p}^+/0} \leq E_{\text{p}^-/0} < (E_{\text{p}^+/\text{p}^-}/3)$ , in the tetrahedrally-directed electron-pair-bonded oxygen ions,  $\text{O}^{2-}$ , in hexagonal lattice based on the 1935 Pauling statistical model using the 1933 Bernal-Fowler water rule.

Chih-Tang Sah  
Xiamen Univ

Date submitted: 05 Nov 2015

Electronic form version 1.4