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Electric field-enhanced water dissociation in nanoporous membranes[1] DEVIN CONROY, RICHARD CRASTER, OMAR MATAR, Imperial College London, HSUEH-CHIA CHANG, Notre Dame University — The dissociation of water with a PN junction is investigated theoretically. The model accounts for the the voltage potential and transport of ions using the Nernst-plank and Maxwell's equations respectively and solved numerically and asymptotically in the small reaction limit. The advantage of the PN junction is that the electric field is very large, which enhances the product yield far from the thermodynamic value. Further, the junction causes the charge of the ions to be separated onto the oppositely charged membrane, forming a travelling wave the has a constant velocity. Preliminary work indicates that the travelling wave undergoes a mobility gradient driven instability, for sufficiently large electric fields, that leads to the formation of fingers.

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