

DFD11-2011-001845

Abstract for an Invited Paper  
for the DFD11 Meeting of  
the American Physical Society

**Rectification Phenomena Across an Asymmetric Nanofluidic Channel**

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We review our recent experimental and theoretical studies of nanofluidic diodes. A continuum theory is developed to show that the literature and our rectification data can be generically classified into two regimes: a low-voltage regime dominated by intra- channel ionic strength (Donnan potential) gradient and a high-voltage regime dominated by external ion depletion. The two regimes drive different anomalous phenomena, like molecular dissociation and microvortex instability, with distinct distinguished limits of dimensionless parameters. Applications to biosensing are discussed.