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A pH-gradient induced method for wetting metal-layer embedded nanopores VENKAT BALAGURUSAMY, GUSTAVO STOLOVITZKY, IBM T.J. Watson Research Center, Yorktown Heights, NY — Solid-state nanopores made on a single layer of Silicon nitride are wet by a number of methods by different workers. Typically, they involve using some low-surface tension liquid like iso propyl alcohol for pre-wetting before filling with the electrolyte solution of interest e.g., a buffered KCl solution both sides of the chamber that partition the nanopore. These methods can also be preceded by a cleaning step which may involve either oxygen plasma or piranha treatment. However we found that these methods were not successful in wetting certain batches of nanopores drilled in a stack of $Si_3N_4/SiO_2/TiN/SiO_2/TiN/SiO_2/TiN/SiO_2/Si_3N_4$ layers. We found that applying buffer solutions at different pH on the two sides of the nanopore greatly accelerated the wetting process from days to few hours and resulted in nanopores with near linear I-V behavior for high salt concentration buffer solutions. We will describe this method and the results for a number of nanopores [1]. Nanopores wet with this pH gradient method translocate DNA molecules like nanopores wet by other methods mentioned here. We believe that the actual mechanism of this wetting process is influenced strongly by the pH effect on SiO_2 surface. Efforts are underway to understand the working of this wetting method by quantum computer simulation methods [2]. [1] V.S.K.Balagurusamy, US Patent 8702944 (April 2014), "A novel nanopore device wetting method " [2] R.Zhou, Soft matter theory/simulations group, IBM Watson Research Center, personal communication

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