

Abstract Submitted  
for the MAR17 Meeting of  
The American Physical Society

**Unexpected Pinhole-shaped-defects in an Ultra-low-noise Solid-state Nanopore: Generation Mechanism and Prevention Methods**  
KAZUMA MATSUI, YUSUKE GOTO, ITARU YANAGI, YOSHIMITSU YANAGAWA, YU ISHIGE, KEN-ICHI TAKEDA, Hitachi, Ltd. — To achieve DNA sequencing with a solid-state nanopore, it is necessary to reduce the electric noise current by lowering the device capacitance. However, we found that pinhole-shaped defects are unexpectedly generated with ultralow capacitance devices. These defects surprisingly attributes to uncontrolled dielectric breakdown in an ultrathin membrane, induced by electric charge imbalance between chambers. Furthermore, theoretical analysis reveals that the charge imbalance mainly originates from the static charge on the surface of a flow cell outside the chambers. We also demonstrated that the generation of defects could be prevented by two methods: to remove static charge using an anti-static agent and to cancel the electric charge imbalance by connecting bypass wiring between the chambers.

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Date submitted: 30 Oct 2016

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