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Effect of nanopore diameter on translocation speed of single-stranded DNA RENA AKAHORI, TAKAHOBU HAGA, TOSHIYUKI HATANO, ITARU YANAGI, TAKESHI OHURA, HIROTAKA HAMAMURA, TOMIO IWASAKI, TAKAHIDE YOKOI, TAKASHI ANAZAWA, Central Research Laboratory, Hitachi, Ltd. — The effect of reducing a nanopore's diameter on the translocation speed of single-stranded DNA (ssDNA) was investigated. Various-sized nanopores (minimum 2.3 nm) were fabricated using transmission electron microscopy and atomic-layer deposition. Reducing the diameter was found to increase the drag force generated from the DNA-nanopore interaction and from viscous drag, thereby slowing down the translocation speed. The drag force of ssDNA was weaker than that of double-stranded DNA (dsDNA). These findings were supported by a molecular dynamics (MD) simulation which predicted that reducing nanopore diameter to almost the same as that of ssDNA (i.e., 1.4 nm) would decrease DNA translocation speed (to 1.4 μs/base) and decrease its variation. Reducing the nanopore diameter is thus a highly effective means of sequencing nanopore DNA.

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