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Single Molecule Transport in Nanometer-scale Pores: A Tool for Polymer Science and Practical Applications

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Nanometer-scale pores provide the physical basis for nerve and muscle activity and some mechanisms of cellular transport. For nearly two decades, we have been using these structures as tools to detect, characterize, and quantify a wide range of analytes including ions, RNA, DNA, proteins, and anthrax toxins [1]. This capability is made possible because the analytes interact with the pore and do not transport through it by diffusion alone. The entry of a molecule into a single nanopore causes a transient, but well-defined decrease in the pore's ionic conductance. Recently, we showed experimentally and theoretically that nanopores discriminate precisely between polymers in an aqueous solution based on the particle size and charge, in a manner akin to mass spectrometry. We will discuss the prospects for this method's use in polymer physics and biomarker detection.

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References

[1] Kasianowicz, J., et al., Ann. Rev. Anal. Chem. 1, 737-766 (2008)