67a Effect of Wall Hinderence on Brownian Motion and Mobility

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As the 80th anniversary of Ruckenstein's birth, 2005 is also the 100th anniversary of Einstein's first paper on Brownian motion [*Annalen der Physik* **19**, 549 (1905)] in which Einstein observed that Avogadro's number N could be deduced by measuring independently the mobility m and diffusion coefficient D of microscopic Brownian particles. In particular, he predicted that the two were related by $D = mRT/N$, where R is the universal gas constant and T is absolute temperature. Jean Baptiste Perrin made such measurements in 1920. By determining the size of single molecules, this achievement was a compelling verification of the molecular nature of matter for which Perrin was awarded the Nobel Prize in 1926. Using TIRM, we are able to measure both the mobility and diffusion coefficient for motion normal to the wall under conditions in which that motion is severely hindered by the wall (reduced by 10 or 100). We show that Einstein's relationship continues to hold even in the presence of severe wall hinderence.