Random Walk Self-Assembly at Nano-Micro Scale

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Modeling of random walk self assembly

Motivation: Assembly efficiency improvement

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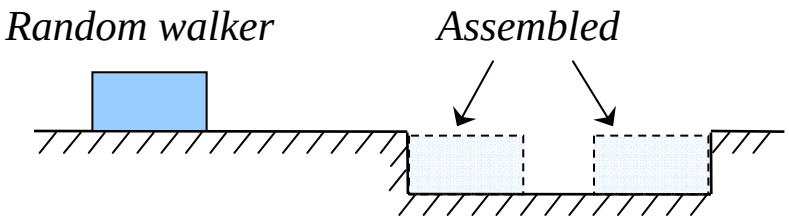
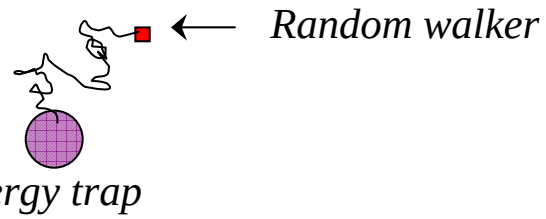
Random Walk Self-Assembly at Nano-Micro Scale

Random walk probability density can represent the motion (ex. time and position) of assembly parts

1D random walk



2D random walk

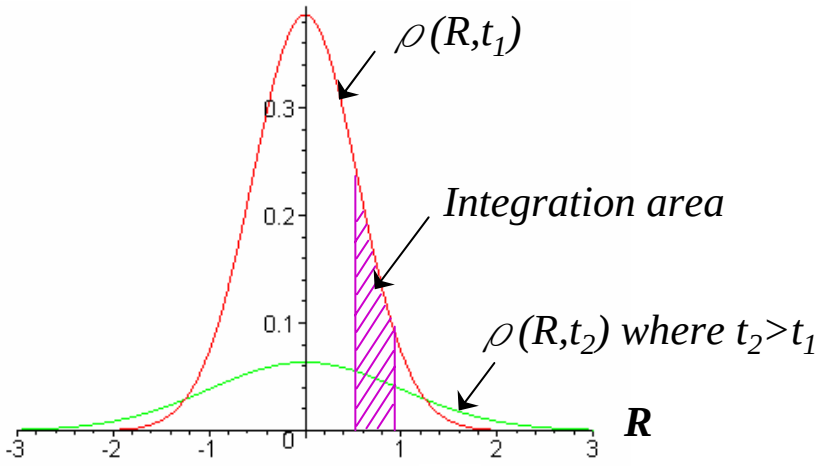


Probability density function

$$\rho(R,t) = \frac{1}{(4\pi Dt)^{\dim/2}} \times e^{\frac{-R^2}{4Dt}}$$

ρ : *Probability density function (limiting distribution)*
D: Diffusion coefficient
t: Time
R: Walking distance from initial point

Probability density distribution



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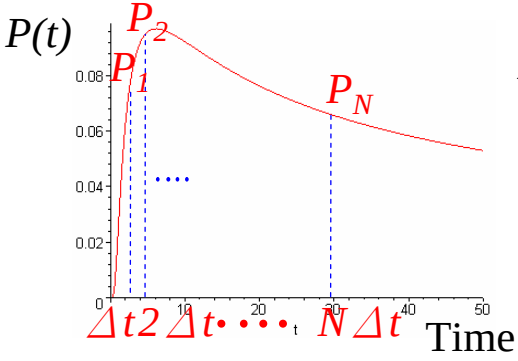
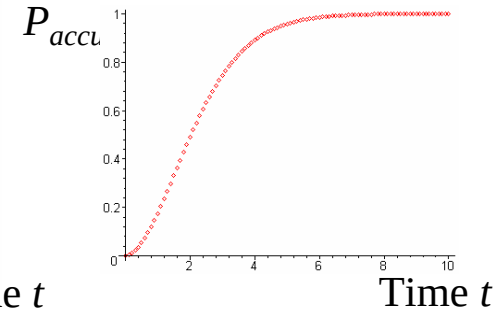
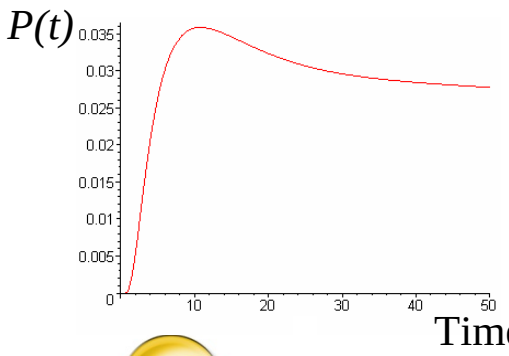
Self-assembly efficiency improvement by observing assembly probability *P(t)* and P_{accu}

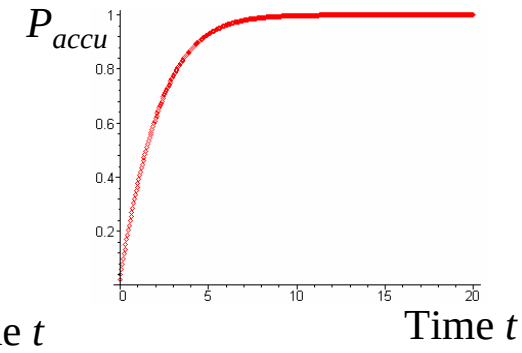
1D assembly probability



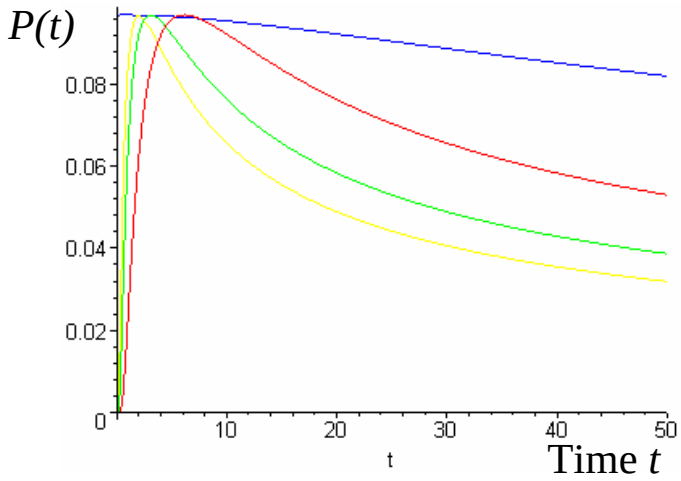


2D assembly probability





Assembly efficient improvement



D = 3/t +0.1 cm²/s

D = 0.5 cm²/s

D = 1.0 cm²/s

D = 1.5 cm²/s

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