Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

Positional Order and Diffusion Processes in Particle Systems HIROSHI WATANABE, Department of Complex, Systems Science, Graduate School of Information Science, Nagoya University, YUKAWA SATOSHI, NOBUYASU ITO, Department of Applied Physics, School of Engineering, The University of Tokyo — In particle systems, a relation between the positional order parameter Ψ and the mean square displacement M is derived to be $\Psi \sim \exp(-vK^2M/2d)$ with a reciprocal vector vK and the dimension of the system d. On the basis of the equiation, the behavior of Ψ is found to be $\Psi \sim \exp(-vK^2Dt)$ when the system involves normal diffusion with a diffusion constant D. While the behavior in two-dimensional solid is predicted to be $M \sim \ln t$, numerical simulations shows a linear diffusion $M \sim t$. This can be explained by a swapping diffusion process which allows particles to diffuse without destroying the positional order.

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Date submitted: 05 Jan 2006 Electronic form version 1.4