

thesisDraftBranch1Simple

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1 thesis

1.1 Melting A

1.1.1 Background re: melting

- Review of theories of melting, 3D, 2D, bulk
- Expectations for 2D finite crystallites

1.1.2 Experiment of Savage et. al

- Setup
- Tuneable Depletion potential
- Results

1.1.3 Simulations

- Motivation
- Justification for using Brownian dynamics
- GROMACS Simulations
- Simulated Depletion Potential
- Simulated Lennard-Jones Potential

- Results
- Discussion

1.2 Melting B

1.2.1 Background

- Colloids: macroscopic system analogous to atomic system
- Experiment by Savage et. al: novel melting kinetics
- Our hypothesis: thermally-activated defects enhance melting rate
- Evidence for hypothesis
- Background Theory

1.2.2 Methods

- Re-analyze data from GROMACS, Part A
- New Brownian Dynamics Simulation Code
- Analysis methods

1.2.3 Results / Figures

- N vs t
- Order vs. N

- Breakdown by layers
- Average disclination charge
- Phase diagram for various ranges of potential

1.2.4 Discussion

1.3 Diameter of Random Clusters

1.3.1 Introduction

1.3.2 Potts Model [?]

1.3.3 Chemical Distance

1.3.4 Diameter

1.3.5 Swendsen-Wang Algorithm

1.3.6 Determining the Chem Distance and Diameter

1.3.7 Procedure for $q > 1$

1.3.8 Procedure for $q > 1$

1.3.9 Simulation Details

1.4 Phase Transitions in Computational Complexity

1.4.1 Background

- Constraint Satisfaction Problems (CSP)
- Proposal: study complexity of percolation model

1.4.2 Percolation

- The Model
- Background / applications

1.4.3 PRAM

- Applications in comp sci
- PRIORITY CRCW

1.4.4 Parallel Algorithm for Percolation

1.4.5 Results

- D_2 vs. p for several system sizes L
- $\log(D_2)$ vs. $\log(L)$
- Distribution of cluster sizes

1.4.6 Discussion