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Modeling the Griffiths Phase in Manganese Intercalated Tantalum Disulfide [Slides]

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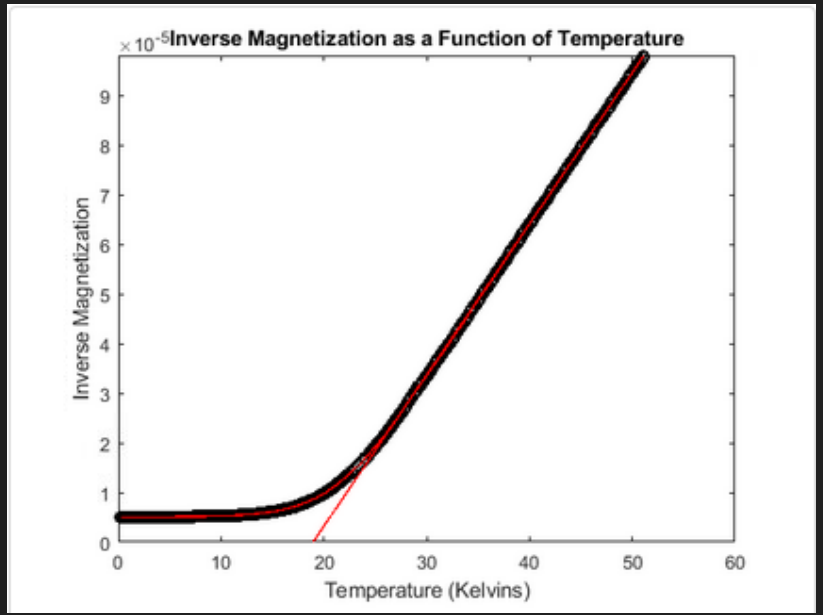
Simulating Griffiths Phase Behavior

Aaron Janaszak and Lukas Stuelke
UNI Summer Undergraduate Research Program
Mentor: Dr. Paul Shand

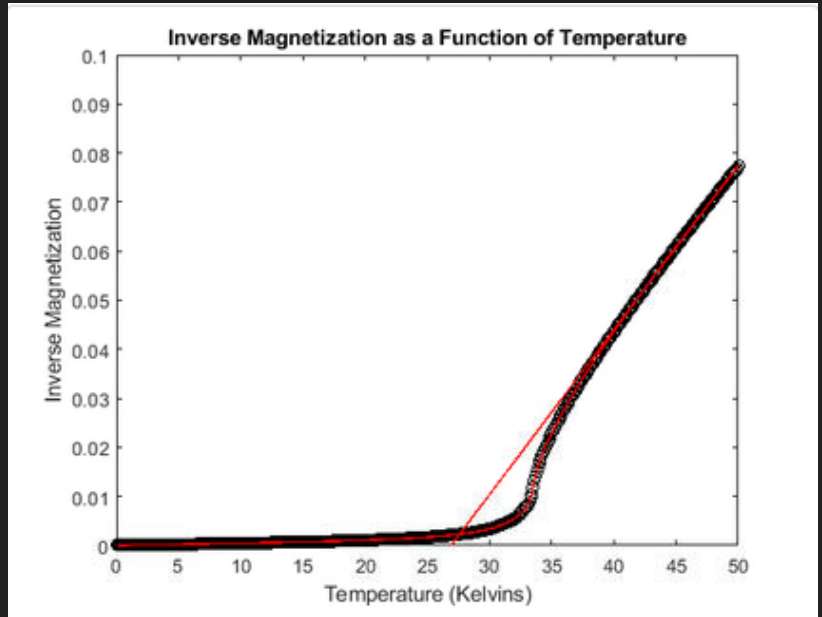
What is the Griffiths Phase?

- In a paramagnet, at high temperatures, inverse magnetization follows the Curie-W eiss law and is linear.
- At lower temperatures, clusters align and magnetization deviates from the Curie-W eiss law.

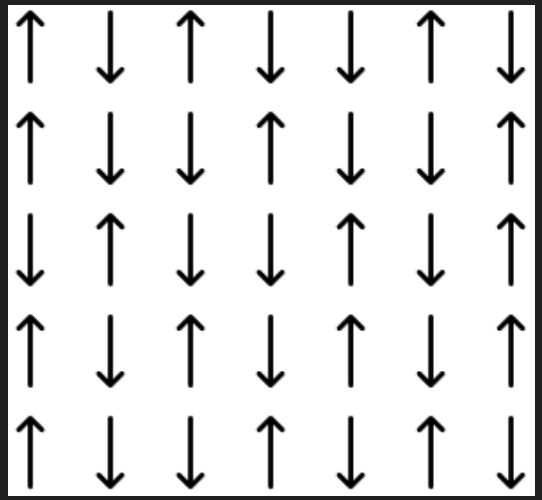
Inverse Magnetization is linear at higher temperatures



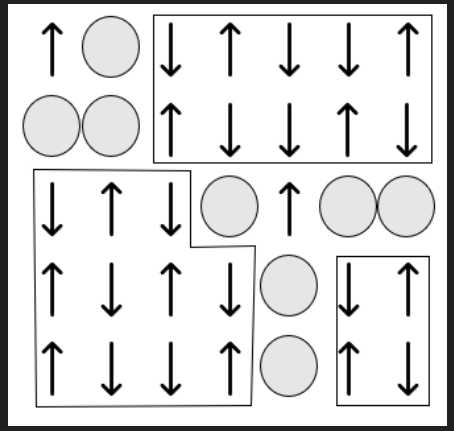
In the Griffiths phase, this linearity is interrupted as shown by the exaggerated curve



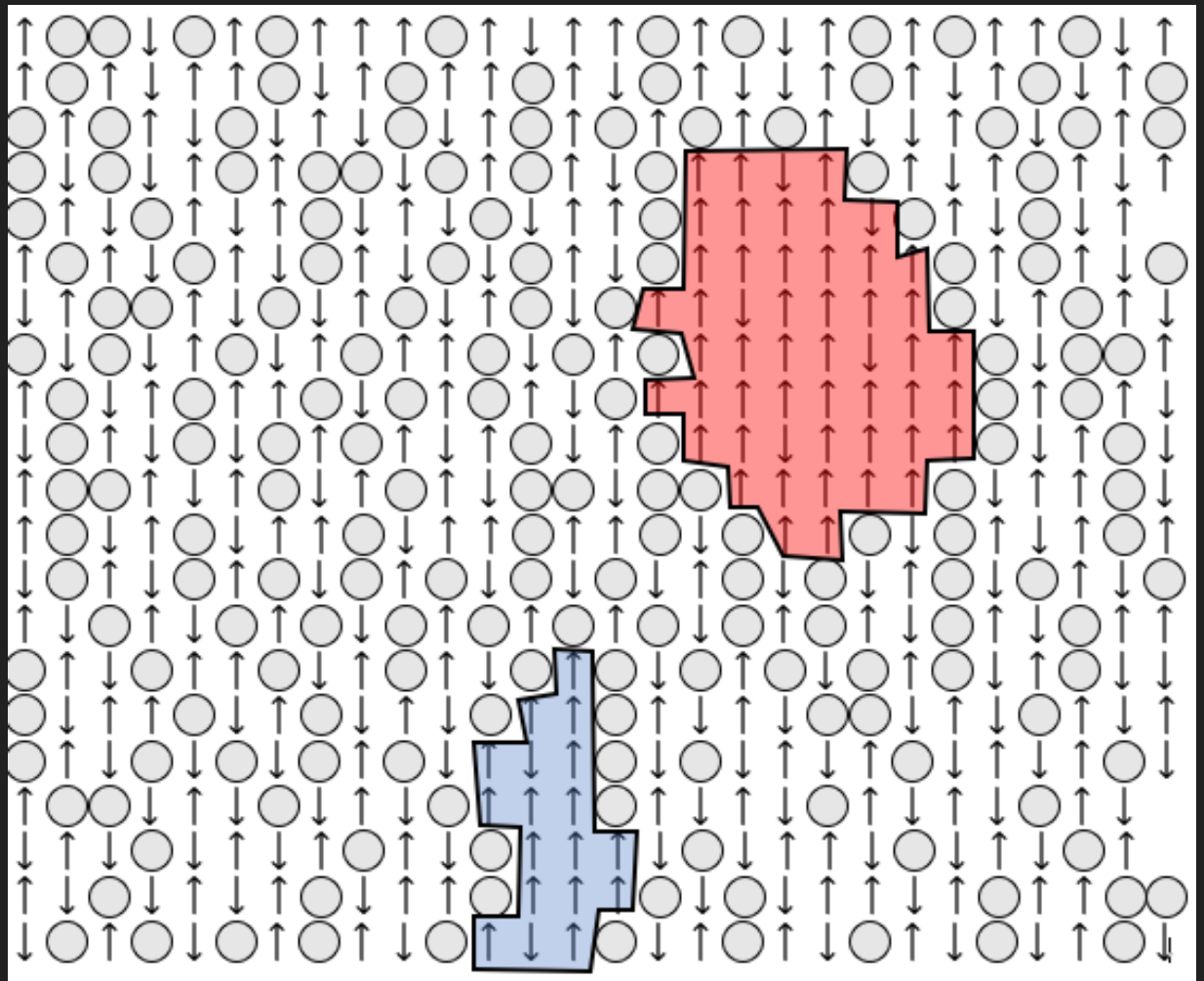
Fully Occupied Crystalline Lattice



Some Moments Removed



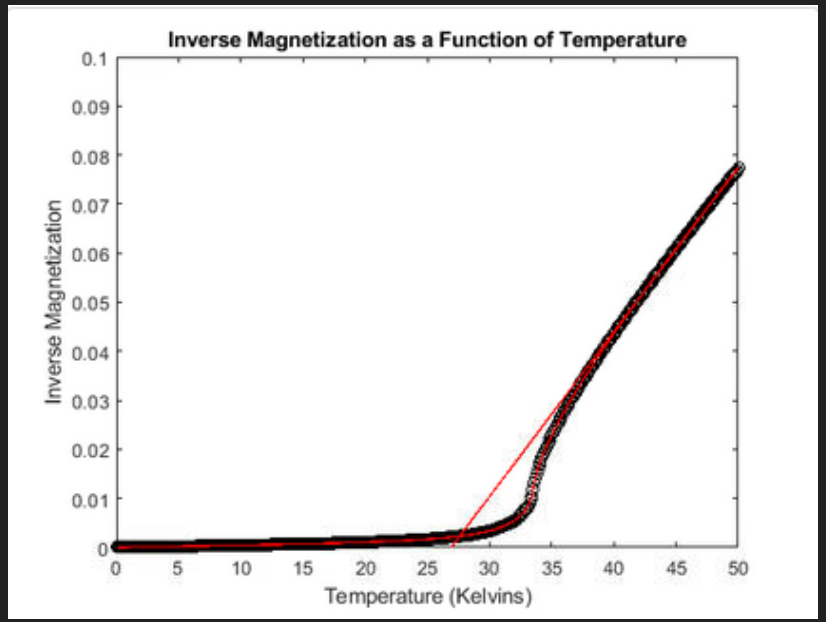
Clusters begin to dominate, displaying Griffiths phase behavior at low temperatures



Purpose

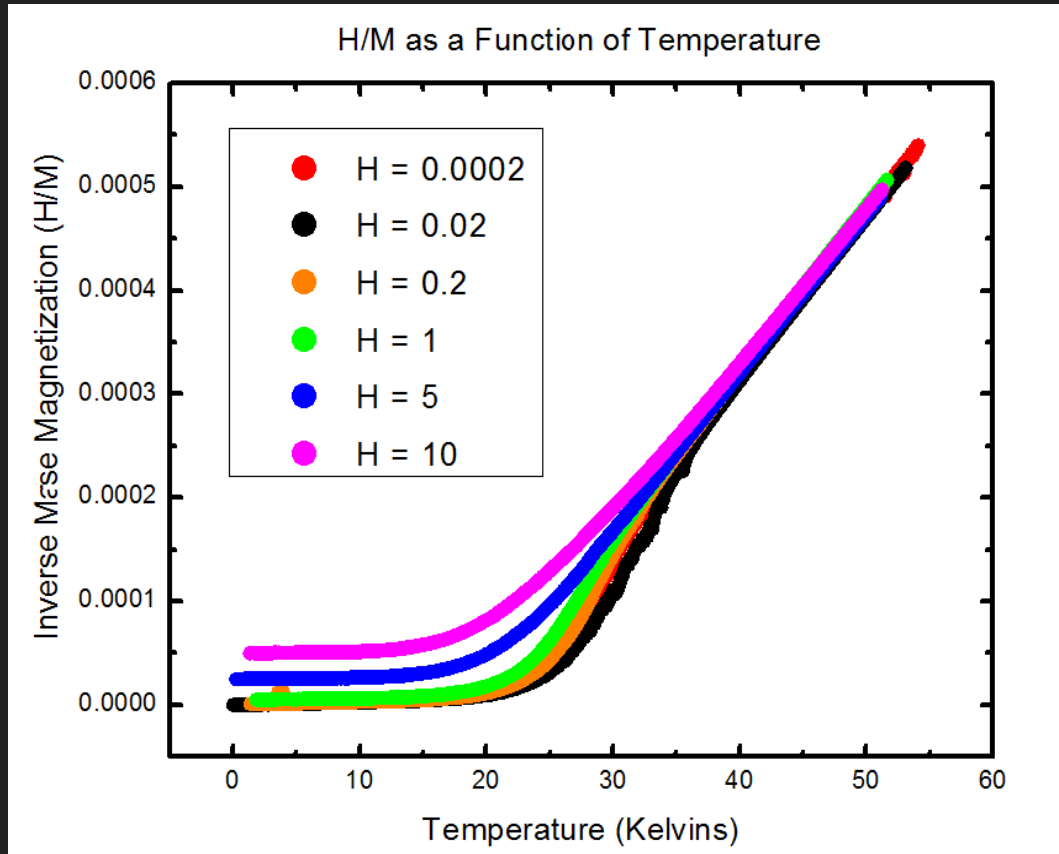
Can we reproduce the Griffiths Phase behavior using a computer model?

And if so, what variables influence this behavior the most?



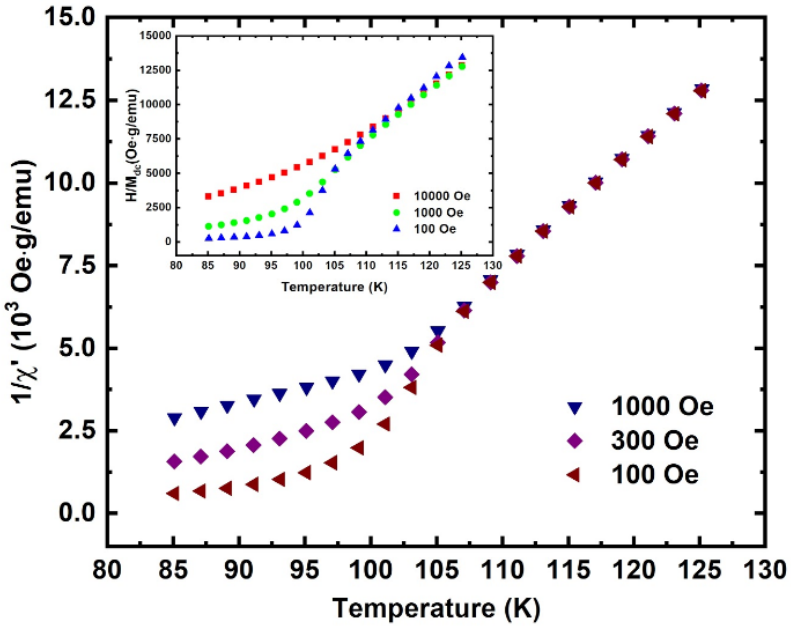
Methods & Data

- Langevin function used to simulate clusters in MATLAB
- Data collection at many values of the external magnetic field

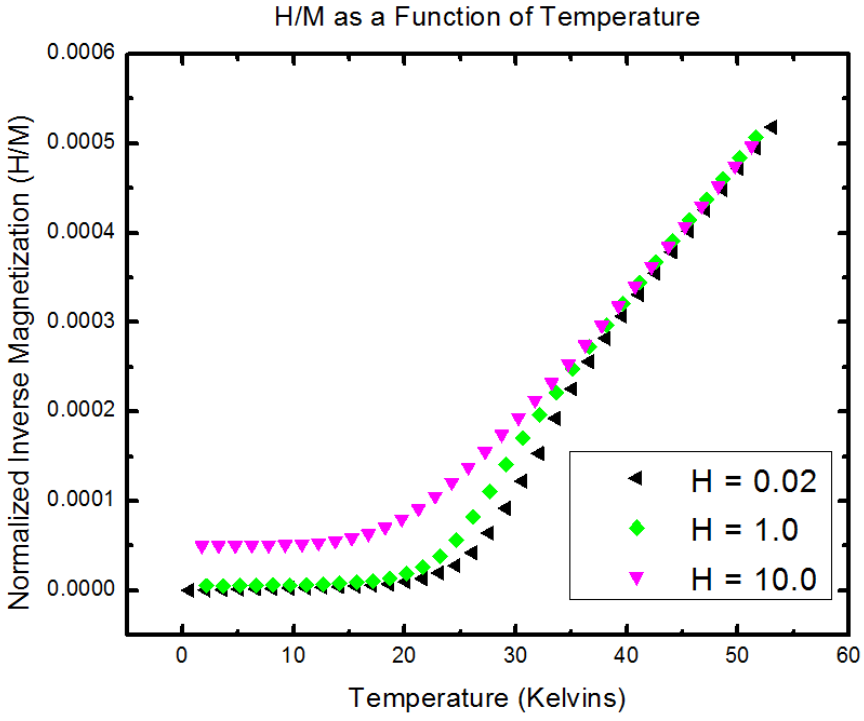


Comparison Between Experimental Results and Computer Model

Experimental Data



Computational Model



Any Questions?

The Griffiths Phase is a result of a spontaneous increase in the overall magnetization of the system primarily influenced by the rare, large clusters transitioning to a ferromagnetic state at the Curie Temperature. We were able to create a MATLAB program that exhibits this trend by using the Langevin function to simulate clusters.

Future Work:

-Exploration of variables and distribution types

Acknowledgements:

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