

## Geochemical Thermodynamics EAS 6211 Fall 2005

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- Lectures:** Monday, Wednesday, Friday 11:05 – 11:55 am, EST L1175
- Books:** Geochemical Thermodynamics 2<sup>nd</sup> Ed.  
Nordstrom, D.K. and Munoz, J.L.  
Blackwell Scientific Publications (1994)  
ISBN 0-86542-274-5
- Thermodynamics in Geochemistry: The Equilibrium Model.  
Anderson, G.M. and Crerar, D.A.  
Oxford University Press (1993)  
ISBN 0-19-506464-X
- Grading:**
- |              |     |
|--------------|-----|
| Problem Sets | 60% |
| Midterm      | 15% |
| Final        | 25% |

### Topics

#### **Math Review**

Types of Functions  
Partial Derivatives  
Exact and Inexact Differentials  
Legendre Transforms

#### **Thermodynamic Terminology**

Intensive, Extensive Properties  
Systems  
Equilibrium  
Reversible Processes

#### **Fundamental Relationships**

Zeroth Law  
First Law  
Second Law  
Combined First and Second Laws  
Third Law  
Statistical Interpretation of Entropy  
Equations of State

#### **Simple Systems**

Free Energy of Formation  
Clapeyron Equation  
Phase Rule  
Phase Diagrams

#### **Thermodynamics of Solutions and Gases**

Raoult's and Henry's Laws  
Partial Molar Properties  
Gibbs-Duhem Relation  
Activity, Fugacity  
Standard States  
Chemical Potential

#### **Electrolytes**

Activity-Composition Relations  
Debye-Huckel, Davies Equations  
Ion pairs

#### **Redox Systems**

Nernst Equation  
pe-pH diagrams

#### **Mineral Equilibria**

Equilibrium Constants  
Pressure, Temperature Dependence  
Chemical Potential Diagrams

#### **Solid Solutions**

Order disorder  
Non-ideal Solutions

#### **Thermodynamic Software Applications of Everything**

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[http://www.deanofstudents.gatech.edu/integrity/policies/honor\\_code.html](http://www.deanofstudents.gatech.edu/integrity/policies/honor_code.html)