

MSE 402, Kinetic Processes in Materials”

Instructor: Prof. Christopher Evans
Spring Semester 2021

Lecture: Tuesday and Thursday, 9:30-10:50 am, Online

Recitation: Tuesday, 5:00-6:30 pm, Online

Primary Textbook

Materials Kinetics Fundamentals, Ryan O’Hayre

Reserve Textbooks

- 1) *Diffusion in Solids*, P. G. Shewmon
- 2) *Phase Transformations in Metals and Alloys*, Porter & Easterling
- 3) *Atom movements: Diffusion and mass transport in solids*, J. Philibert
- 4) *Kinetics of materials*, Balluffi, Allen, & Carter
- 5) *Kinetic Processes: Crystal Growth, Diffusion, and Phase Transitions in Materials*, K. A. Jackson
- 6) *Kinetic theory in the earth sciences*, A. C. Lasaga
- 7) *Mathematics of diffusion*, J. Crank
- 8) *Physical Chemistry*, Silbey & Alberty
- 9) *Polymer Chemistry*, Heimenz & Lodge

Instructor and TA information

Instructor: Prof. Evans

e-mail: cme365@illinois.edu, Office Hours: Online by appointment

Course TAs: Conan Huang (conanlh2@illinois.edu), Craig Daniels (daniel13@illinois.edu);

Undergrad TA: Catherine Ott (cbo3@illinois.edu); **Computational TA**:

Office hours: Wed 4-6 pm (Online), Thurs 6-7 pm (Online), Wed and Thurs 5-6 (Online, Computational office hours)

Grading

1 midterm exam (Tuesday 3/18, 9:30-10:50 am) = 25%

1 final exam (Tuesday 5/11, 1:30-4:30) = 35%

Homeworks (~8 with lowest score dropped) = 25%

Quizzes (5 with the lowest score dropped) = 15%

Course Outline (29 sessions)

- I. Introduction (1)
- II. Review of Thermo (2)
- III. Chemical Reaction Kinetics (3)
- IV. Diffusion basics, in alloys, polymers, glasses, ionic compounds (8)
- V. Surface and Interface Reactions (4)
- VI. Phase Transformations, nucleation and growth, solidification, spinodal decomposition (7)
- VII. Microstructural evolutions, coarsening, sintering (4)