Boulder School for Condensed Matter and Materials Physics, July 9-August 3, 2012

Polymers in Soft and Biological Matter

Reading Material

1. **Fundamental Forces 1 [P.Pincus]**
2. **Fundamental Forces 2 [P.Pincus]**
3. **Fundamental Forces 3 [P.Pincus]**
4. **Surfaces and interfaces 1** [**T.Kuhl**]
5. **Surfaces and interfaces 2** [**T.Kuhl**]
6. **Introduction to scattering techniques [T. Kuhl]**
7. **Introduction to** Microscopy [**D. Weitz**]
8. **Introduction to** Rheology and Microrheology [**D. Pine**]
9. **Microfluidics** [**E. Kumacheva**]
10. **Introduction to computer simulations I [K.Kremer**]
    K. Kremer, K. Binder, Comp. Phys. Rep. **7**, 259, 1988
    C. Peter, K. Kremer, Faraday Disc. **144**, 9, 2010
11. **Introduction to computer simulations II [K.Kremer**]
    Everaers et al, Science, **303**, 823, 2004
    Frenkel and Smit "Understanding Molecular Simulations", Academic Press
12. **Computer simulations I** [**D.Frenkel]**
13. **Computer simulations II** [**D.Frenkel]**
14. **Computer simulations III** [**D.Frenkel]**
15. **Introduction to hydrodynamics I** [**L.Mahadevan**]
16. **Hydrodynamics II** [**L.Mahadevan**]
17. **Hydrodynamics III** [**L.Mahadevan**]
18. **Active systems I** [**F.MacKintosh**]
19. **Active systems II** [**F.MacKintosh**]
20. **Polymer physics I** [**A.Grosberg]**
    A. Y. Grosberg & A. R. Khokhlov "Statistical Physics of Macromolecules" AIP 1994; Chapter 1 (pages 1-27 and 41-59); Chapter 2 (pages 79-93)
    M. Rubinstein & R. H. Colby "Polymer Physics", Oxford 2003; Chapter 2 (pages 49-63 and 66-78 and 98-102)
    A. Y. Grosberg & A. R. Khokhlov "Giant Molecules: Here, There, and Everywhere", World Scientific 2010 (pages 152-162)
21. **Polymer physics II** [**M.Rubinstein**]
    M. Rubinstein & R. H. Colby "Polymer Physics", Oxford 2003; Chapter 3 (pages 102-109, 113-121 and 125-129); Chapter 4 (pages 137-159 and 163-165)
22. **Polymer physics III** [**M.Rubinstein**]
    M. Rubinstein & R. H. Colby "Polymer Physics", Oxford 2003; Chapter 5 (pages 171-186 and 190-191)
23. **Polymer physics IV** [**A.Grosberg]**
    A. Yu. Grosberg & A. R. Khokhlov "Statistical Physics of Macromolecules" AIP 1994 chapter 1 (pages 27-41) Chapter 3 (pages 119-148)
24. **Charged polymers I** [**M.Rubinstein**]
    A. V. Dobrynin and M. Rubinstein "Theory of Polyelectrolytes in Solutions and at Surfaces", Prog. Polym. Sci. 30 (2005) 1049–1055, 1058-1075
25. **Charged polymers II** [**M.Rubinstein**]
    A. V. Dobrynin and M. Rubinstein "Theory of Polyelectrolytes in Solutions and at Surfaces", Prog. Polym. Sci. 30 (2005) 1075–1091

26. **Charged polymers III** [**M.Rubinstein**]
    A. V. Dobrynin, R. H. Colby and M. Rubinstein "Polyampholytes" Journal of Polymer Science: Part B: Polymer Physics, Vol. 42, 3513–3538 (2004)
27. **Networks and gels I** [**Y.Rabin**]
    M. Rubinstein and R.H. Colby, "*Polymer Physics*" (Oxford, 2003), Chapters 6 & 7
    P.-G. de Gennes, "*Scaling Concepts in Polymer Physics*" (Cornell, 1979), Chapter 5
28. **Networks and gels II** [**Y.Rabin**]
    S. V. Panyukov and Y. Rabin, "Statistical Physics of Polymer Gels", Phys. Rep. **269**, 1 (1996)
29. **Polymer dynamics I** [**T.McLeish**]
30. **Polymer dynamics II** [**T.McLeish**]
31. **Polymer dynamics III** [**T.McLeish**]
32. **Brushes and micelles I** [**E.Zhulina**]
33. **Brushes and micelles II** [**E.Zhulina**]
34. **Block-copolymers** [**E.Zhulina**]
35. **Biopolymers** [**A.Grosberg**]
    A. Y. Grosberg & A. R. Khokhlov "Statistical Physics of Macromolecules" AIP 1994, Chapter 7, pages 289-333
36. **Disordered polymers** [**A.Grosberg**]
    A.Y.Grosberg "Disordered Polymers", Physics - Uspekhi, v. 40, n. 2, p. 125-158, 1997; http://ufn.ru/en/articles/1997/2/b/
37. **Semi-flexible polymers** [**F.MacKintosh**]
38. **Liquid crystals I** [**N.Clark**]
39. **Liquid crystals II** [**N.Clark**]
40. **Liquid crystals III** [**N.Clark**]
41. **Surfactants and membranes I** [**S. Safran**]
    S.A.Safran "Curvature elasticity of thin films," Advances in Physics, v. 48, n. 4, pp. 395-448, 1999.
42. **Surfactants and membranes II** [**S. Safran**]
43. **Mixed Membranes and Rafts [S. Safran]**
44. **Introduction to colloids [D.Weitz]**
45. **Physics of Colloids I** [**D.Pine**]
46. **Physics of Colloids II** [**D.Pine**]
47. **Colloids I** [**P.Chaikin**]
48. **Colloids II** [**P.Chaikin**]
49. **Biology and Soft Matter by Numbers.** [**Y.Rabin]**
    R. Phillips, J. Kondev, J. Theriot, "*Physical Biology of the Cell"* (Garland, 2009)
    A.D. Bates and A. Maxwell, "*DNA Topology*" (Oxford, 2005)
50. **Proteins I** [**E.Shakhnovich**]
51. **Proteins II** [**E.Shakhnovich**]
52. **Proteins III** [**E.Shakhnovich**]
53. **Viruses I [R.Bruinsma]**
    W.H.Roos, R.Bruinsma, J.G.L.Wuite "Physical virology" Nature Physics, v. 6, pp. 733– 743, 2010.
54. **Viruses II** [**R.Bruinsma**]
55. **Biophysics** [**Bruinsma**]
    G.Benedek, F.Villars "Phyisics with Illustrative Examples from Medecine and Biology: v. 3 Electricity and Magnetism", second edition, Springer Verlag, 2000