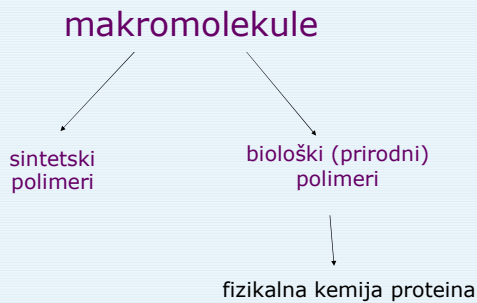
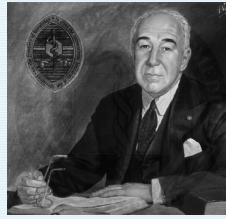


fizikalna kemija makromolekula



Edwin J. Cohn



Topljivost i kiselo-bazna svojstva proteina

Cohn, E. J., Hendry, J. L., and Prentiss, A. M., "Studies in the Physical Chemistry of the Proteins. V. Molecular Weights of the Proteins", *J. Biol. Chem.* 63 (1925) 721-766.

Cohn, E. J., "The Properties and Functions of Plasma Proteins with consideration of the Methods for their Separation and Purification", *Chem. Rev.* 28 (1941) 395.

Simoni R D et al. *J. Biol. Chem.* 2002;277

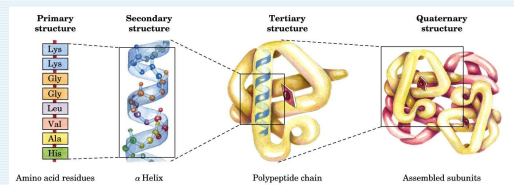
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jbc

Klasični način opisa proteina:

- Primarna struktura - redosljed (sekvencija) aminokiselina
- Sekundarna struktura - konformacija peptidnih lanaca
- Tercijarna struktura
- Kvaterna struktura

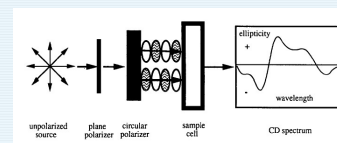
Razine strukture proteina



Spektroskopsko istraživanje sekundarne strukture proteina

- Cirkularni dikroizam (*Circular dichroism*, CD)
- Infracrvena (IR) i Raman spektroskopija
- Nuklearna magnetska rezonancija (NMR)

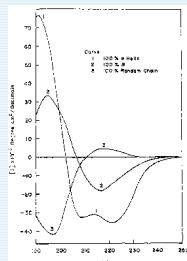
Fizikalni principi CD-a



- Kiralne ili asimetrične molekule daju CD spektar zato jer različito apsorbiraju lijevo i desno polariziranu svjetlost i zato se smatraju "optički aktivnim"

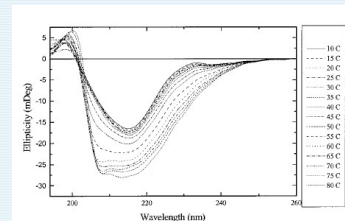
Sekundarna struktura proteina iz CD spektara

- različita vrsta proteina daje različite CD spektre



Sekundarna struktura proteina iz CD spektara

- CD spektri su posebno korisni za određivanje temperaturne ovisnosti sekundarne strukture proteina.



Sekundarna struktura proteina iz CD spektara

ostale informacije:

- (1) interakcije protein - ligand;
- (2) termodinamika smatanja (*folding*) proteina;
- (3) promjene konformacije i agregacija proteina;
- (4) međuproducti smatanja;
- (5) kinetika smatanja proteina.

N. J. Greenfield, Applications of circular dichroism in protein and peptide analysis, *Trends in analytical chemistry*, vol. 18, no. 4, 1999

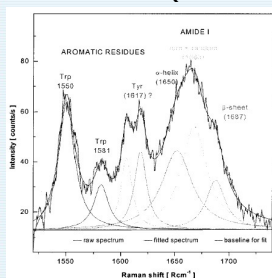
Sekundarna struktura proteina iz IR i Ramanskih spektara (vibracije!)

- amidne vrpce se najčešće koriste za istraživanje strukture proteina

Principal Amide I Frequencies Characteristic of Protein Secondary Structures

Conformation	H ₂ O	D ₂ O
α -helix	1650-1657	1647-1654
Antiparallel β -sheet	1612-1640;	1628-1635
	1670-1690 (weak)	
Parallel β -sheet	1626-1640	
Turn	1655-1675	
	1680-1696	
Unordered	1640-1651	1643

Sekundarna struktura proteina iz IR i Ramanskih spektara (vibracije!)



- Ramanski spektri daju informacije o aromatskim ostacima u području oko 1620 cm⁻¹

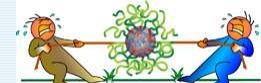
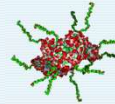
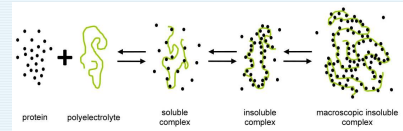
Sekundarna struktura proteina pomoću NMR spektroskopije

- Određivanje sekundarne strukture pomoću NMR spektroskopije ne zahtijeva potpunu trodimenzijsku strukturu analizu kao što zahtijeva rendgenska kristalografija.
- Poznavanje kemijskih pomaka amida i protona su u principu sve što je potrebno.
- Spektroskopija NMR je najsnažnija i najtočnije metoda određivanja sekundarne strukture proteina bez trodimenzijske strukture.

Interakcija proteina sa...

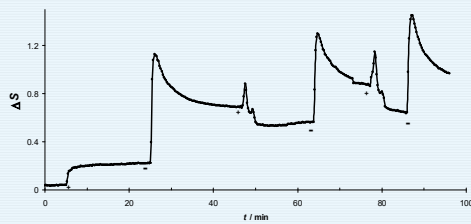
- ... polielektrolitima
 - ... polisaharidima
 - ... DNA
 - ... itd
- Primjena!!

Kompleksi protein-polielektrolit

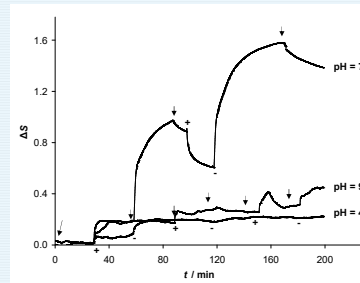


Karakterizacija polielektrolitno-proteinskih višeslojeva pomoću optičke reflektometrije

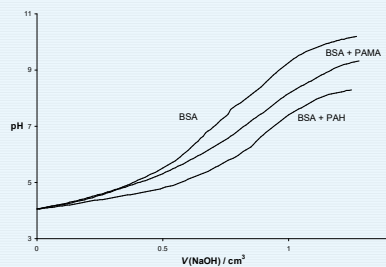
PVP⁺/BSA



PAMA/BSA

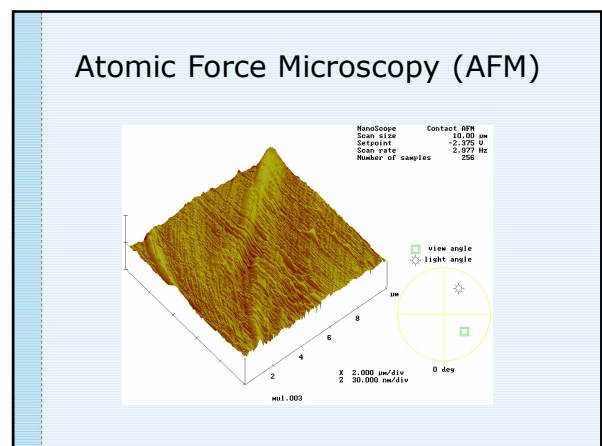
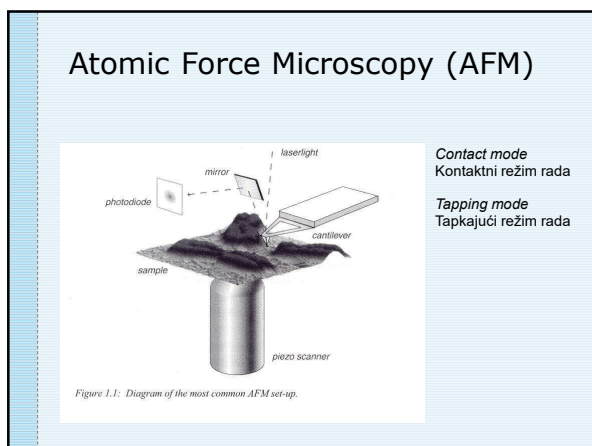
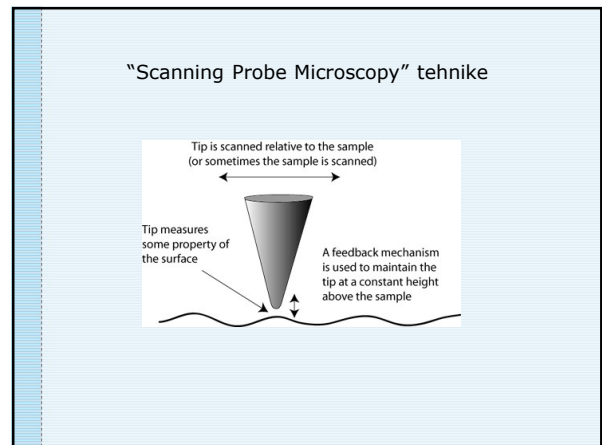
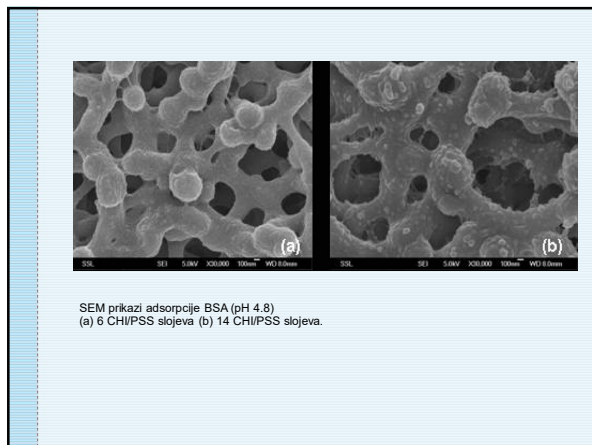
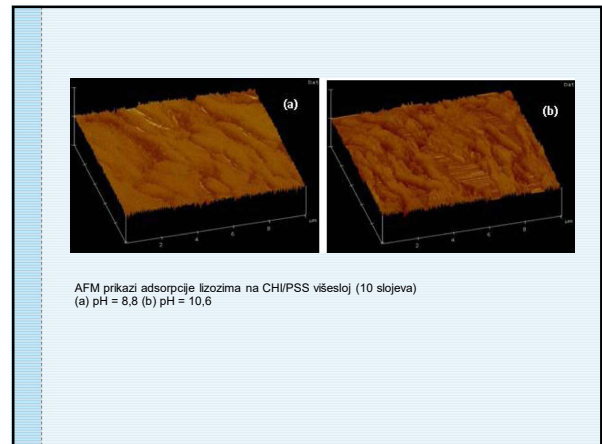
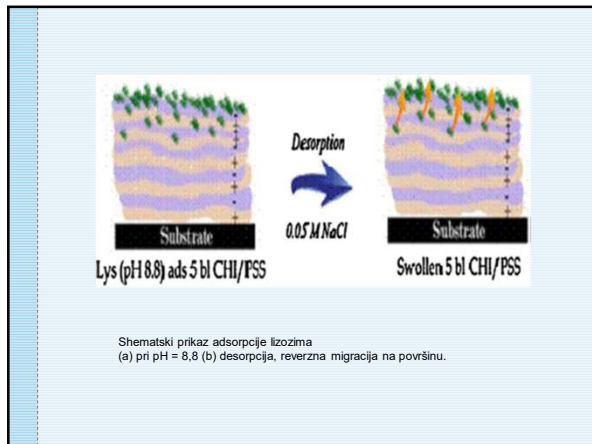


potenciometrijska titracija

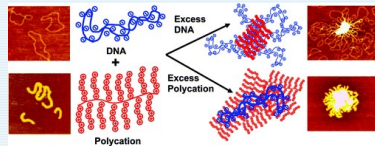


J. Mathew et al., *Fabrication of switchable protein resistant and adhesive multilayer membranes*, *Colloids and Surfaces B: Biointerfaces* 94 (2012) 118– 124

- Fabrication of protein adhesive and resistant surfaces based on chitosan/polystyrene sulfonate (CHI/PSS) multilayer membranes is presented. Adsorption behavior of bovine serum albumin (BSA) and lysozyme to CHI/PSS multilayer was studied.



Polyelectrolyte – DNA complexes



D. Störkle, S. Duschner, N. Heimann, M. Maskos, and M. Schmidt, Complex Formation of DNA with Oppositely Charged Polyelectrolytes of Different Chain Topology: Cylindrical Brushes and Dendrimers, *Macromolecules*, 2007, 40 (22), pp 7998–8006.

Seminarske prezentacije:

cca 10 min + diskusija

25. 5.

1. 6.

15. 6. predrok?