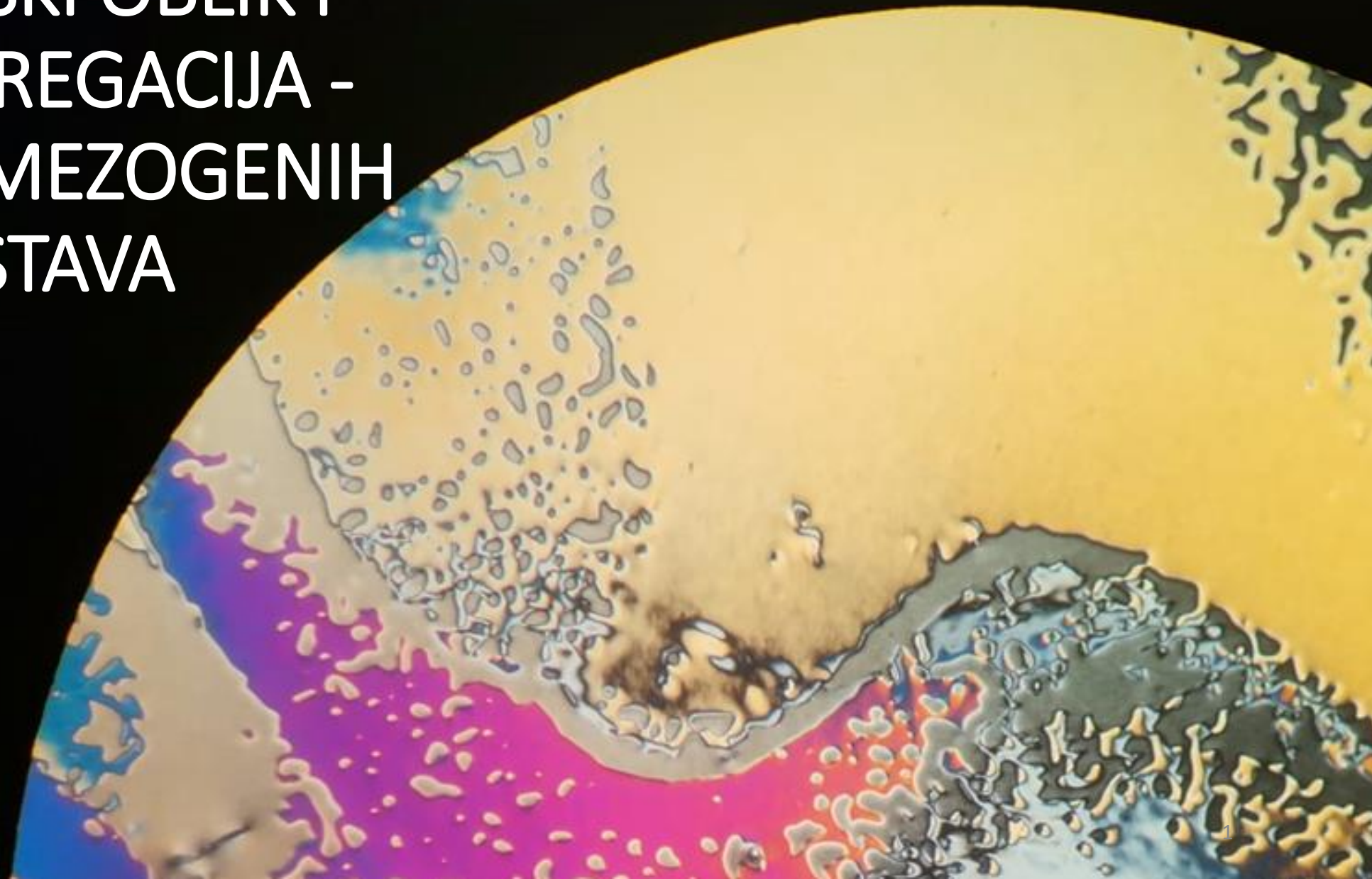
MOLEKULSKI OBLIK i MIKROSEGREGACIJA - POKRETAČI MEZOGENIH SVOJSTAVA



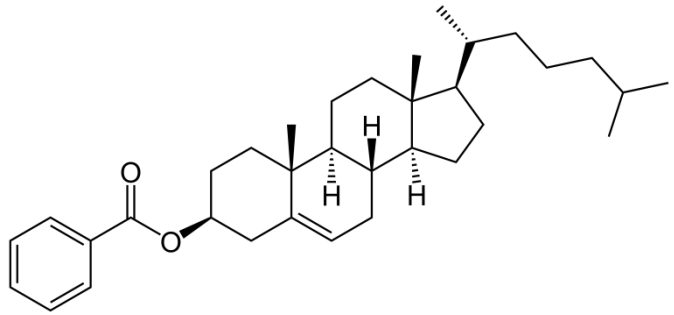
Antonija Ožegović

Institut Ruđer Bošković

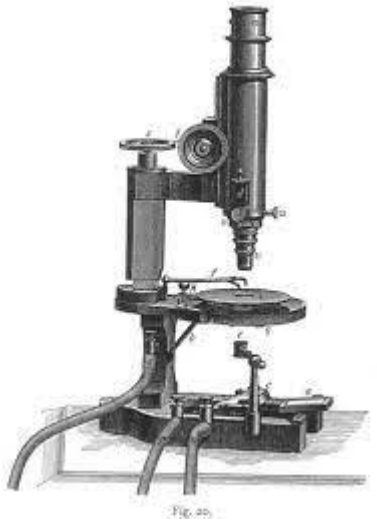
08.12.2022

Uvod u tekuće kristale (LC)

- Prvi tekući kristal otkrio je 1888. godine Friedrich Reinitzer proučavajući estere kolesterola
- Kolesteril benzoat ima dvije točke taljenja: 145°C i 178°C

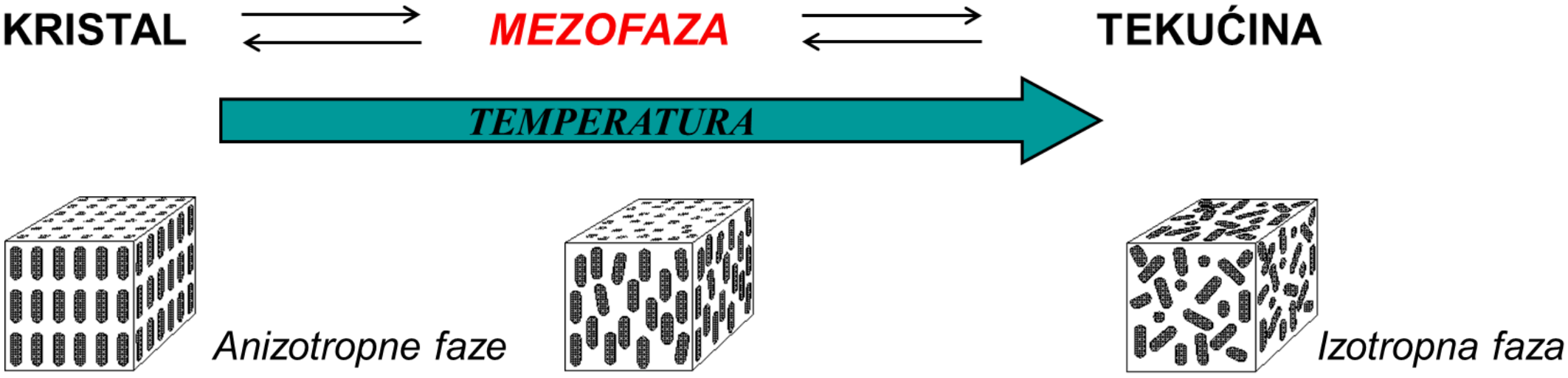


- Otto Lehmann potvrdio je neobičnu pojavu korištenjem polarizacijskog optičkog mikroskopa s grijačim postoljem
- *Soft crystals, Floating crystals, Crystalline fluids*



Što su tekući kristali?

- Tekući kristali su spojevi koji se po svojim svojstvima i uređenosti nalaze između kristala i izotropnih tekućina
- Anizotropne tekućine

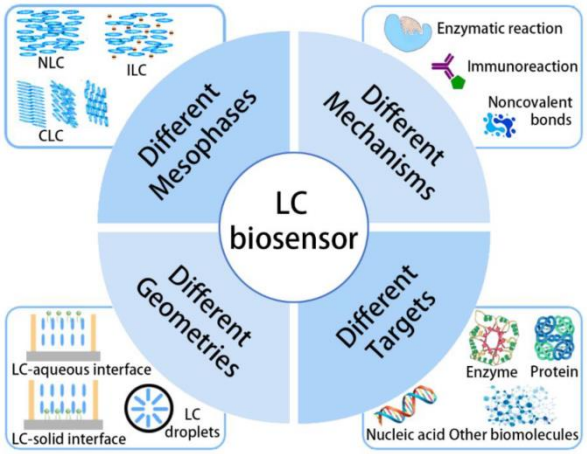


- orijentacijska uređenost
- prostorna uređenost u 3D

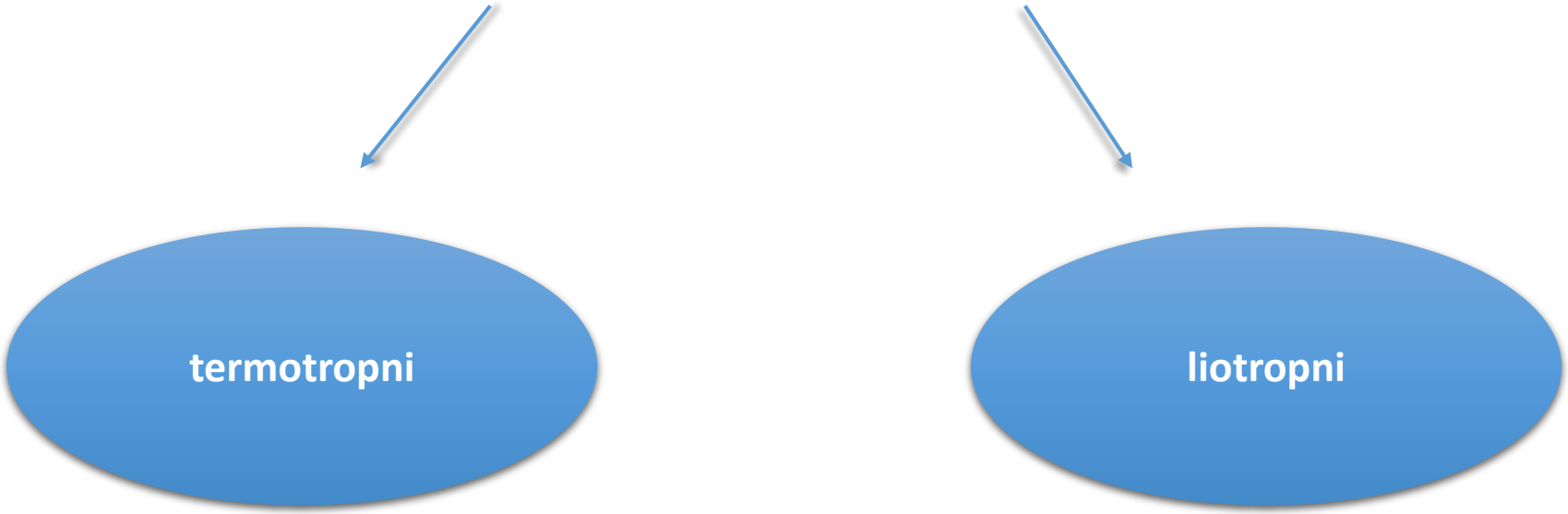
- orijentacijska uređenost

- nema orijentacijske uređenosti
- nema prostorne uređenosti

Gdje se upotrebljavaju?

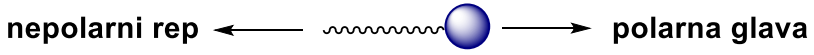


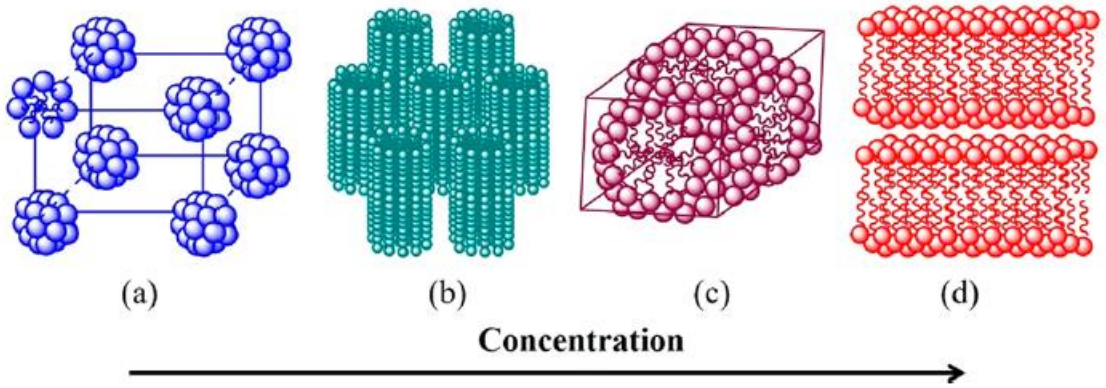
Podjela i oblik molekula koje čine LC faze



Podjela i oblik molekula koje čine LC faze

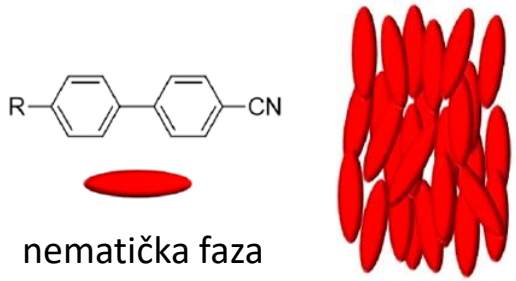
LIOTROPNI TEKUĆI KRISTALI



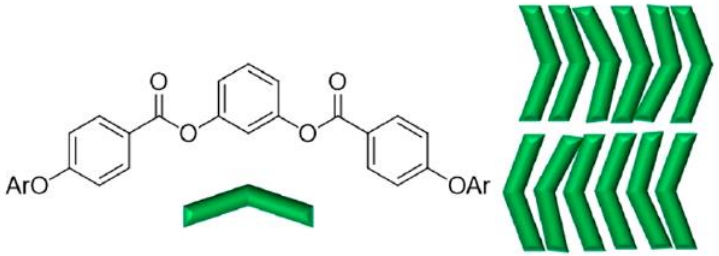


Podjela i oblik molekula koje čine LC faze

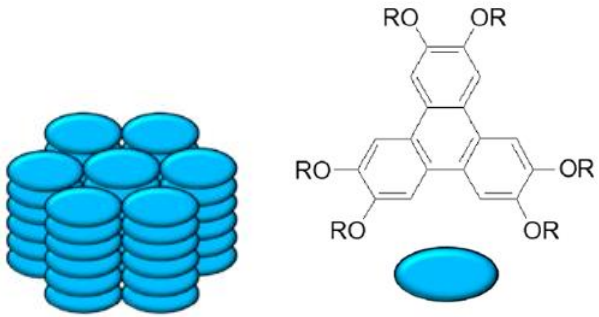
TERMOTROPNI TEKUĆI KRISTALI



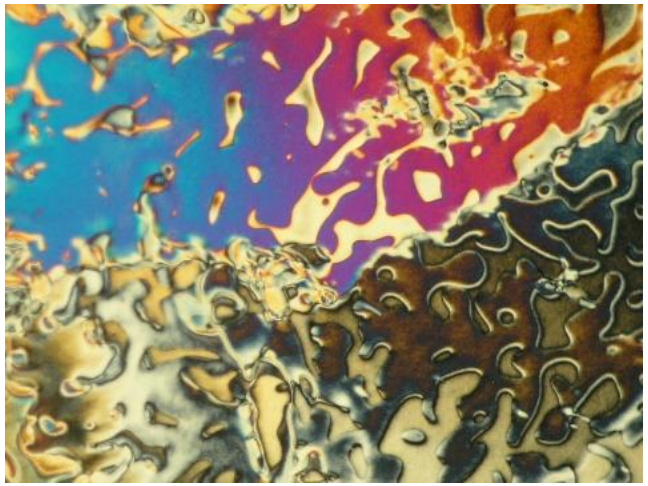
nematička faza



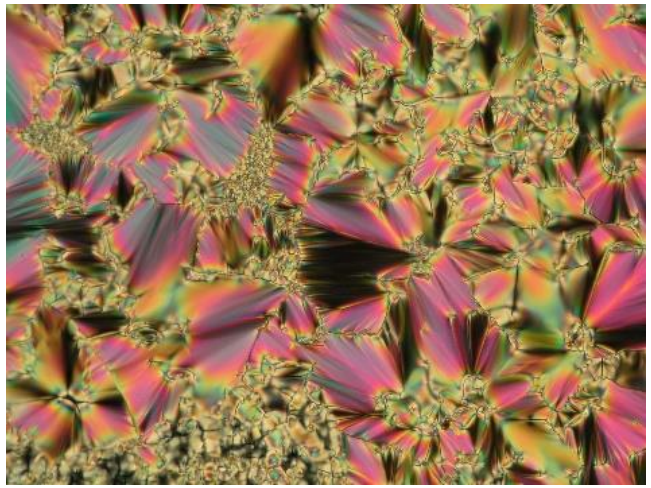
smektička faza



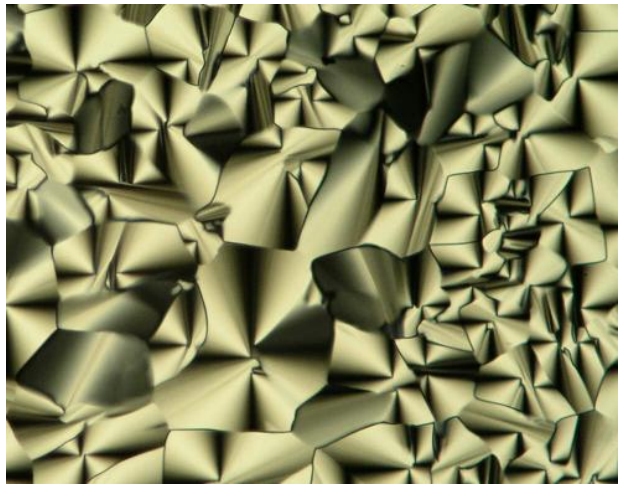
kolonska faza



Mramorna tekstura

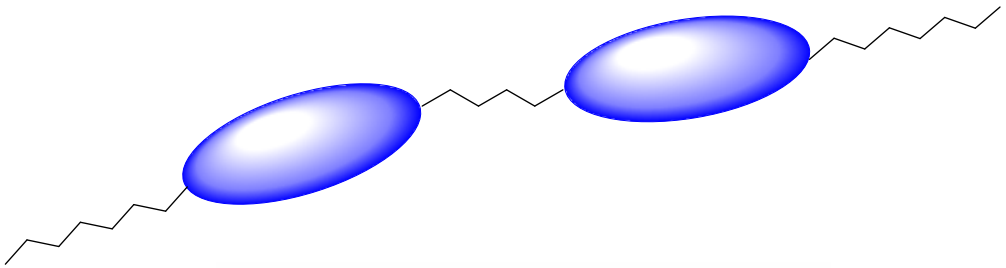


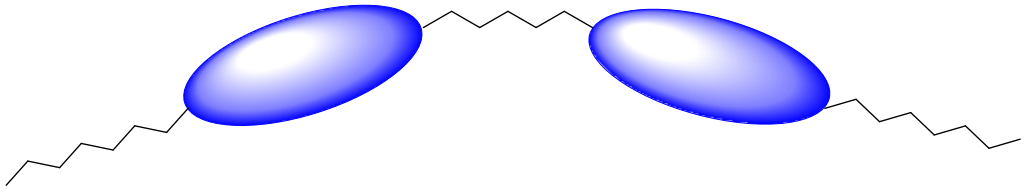
Lepezasta tekstura

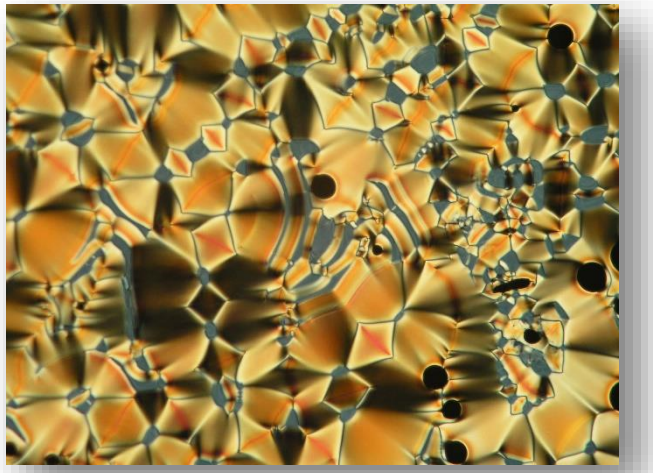


Mozaična tekstura

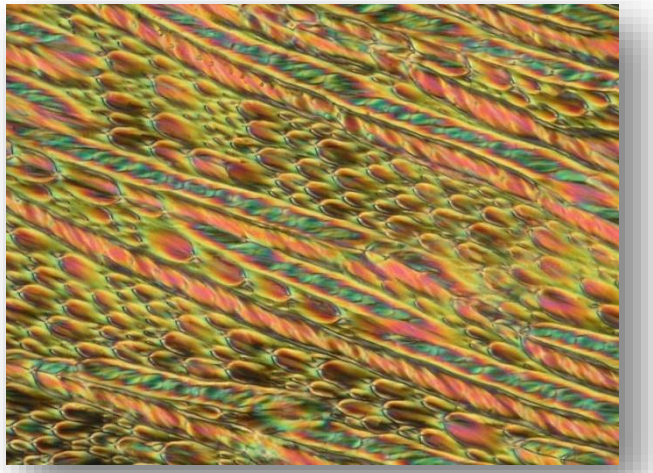
Podjela i oblik molekula koje čine LC faze





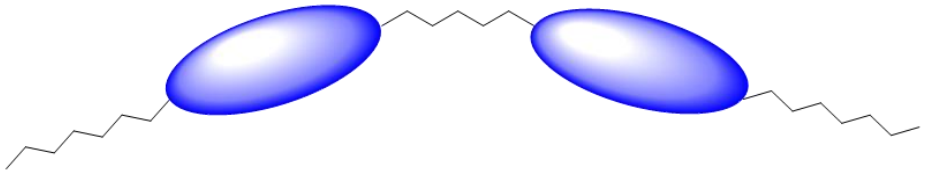


Tekstura nematičke faze štapićastog dimera



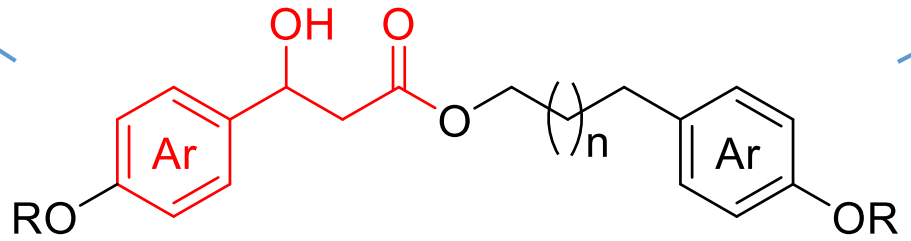
Tekstura N_{TB} faze svijenog dimera

Naše istraživanje…

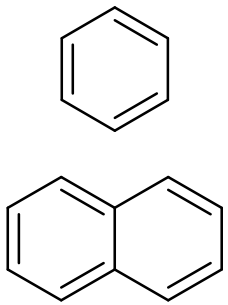


n = 1, 3, 5

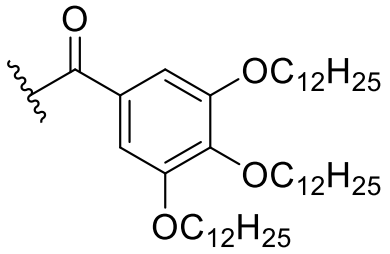
kiral / rac

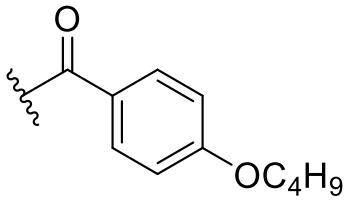


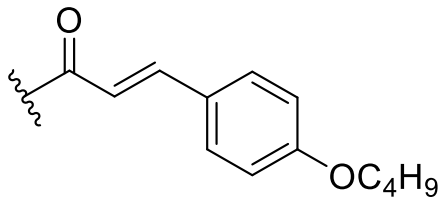
Ar



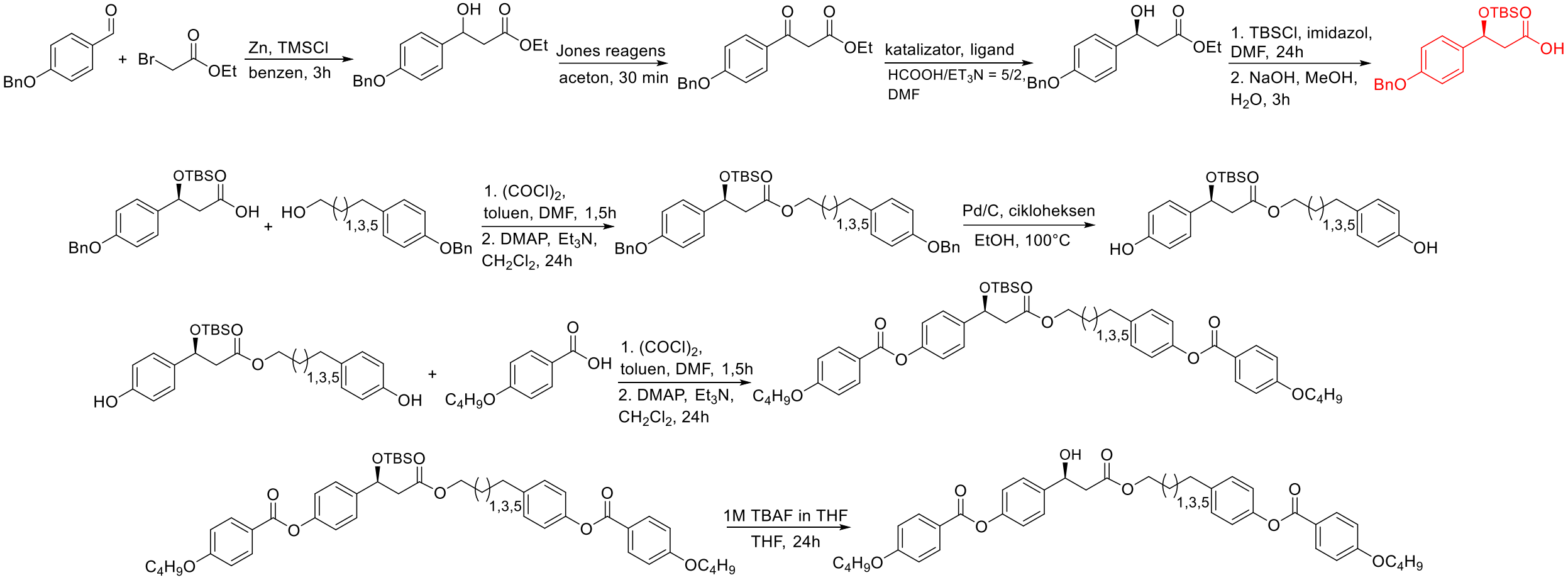
R







Sinteza

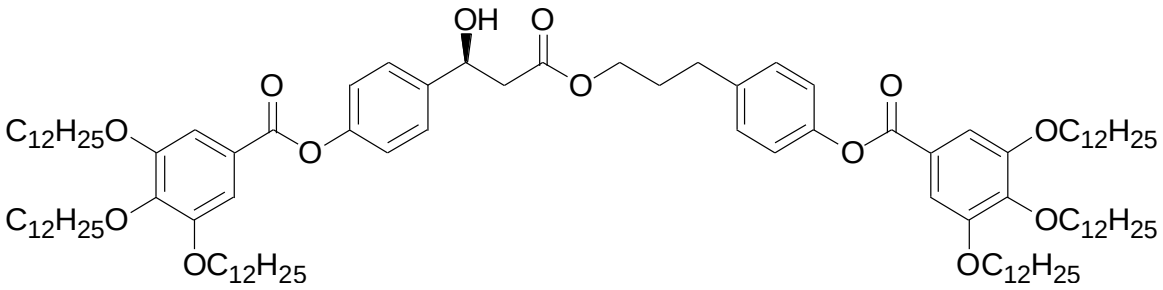


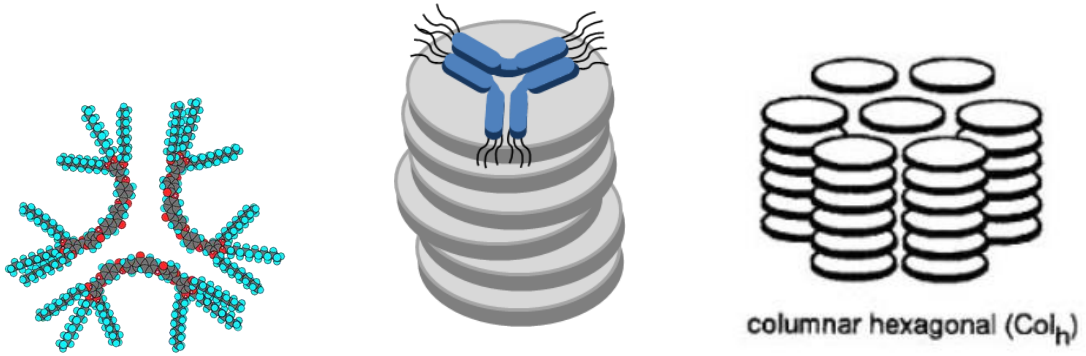
Irena Dokli, Antonija Ožegović, Aleksandra Šimanović, Matija Hromin, Anamarija Knežević, Aleksandar Višnjevac, Andreja Lesac, *The Journal of Organic Chemistry* **2022** 87(21), 14045-14057.

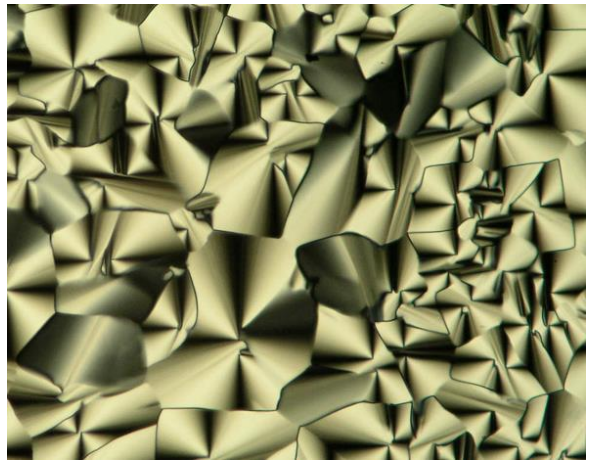
Mikrosegregacija

- Oblik molekula, reducirana simetrija, mikrofazna segregacija i međumolekulske interakcije potiču samoudruživanje i samoorganizaciju molekula u tekuće – kristalne faze

Kolonska heksagonalna faza



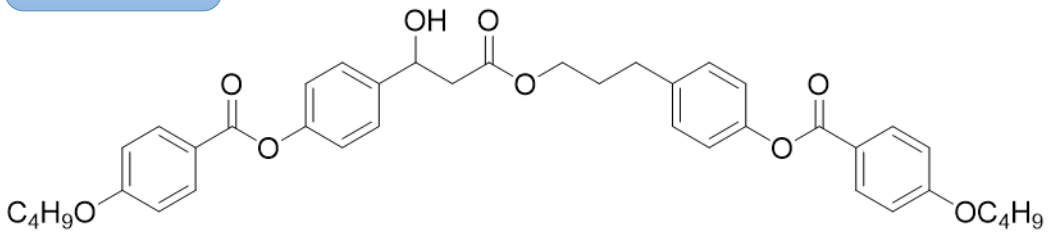


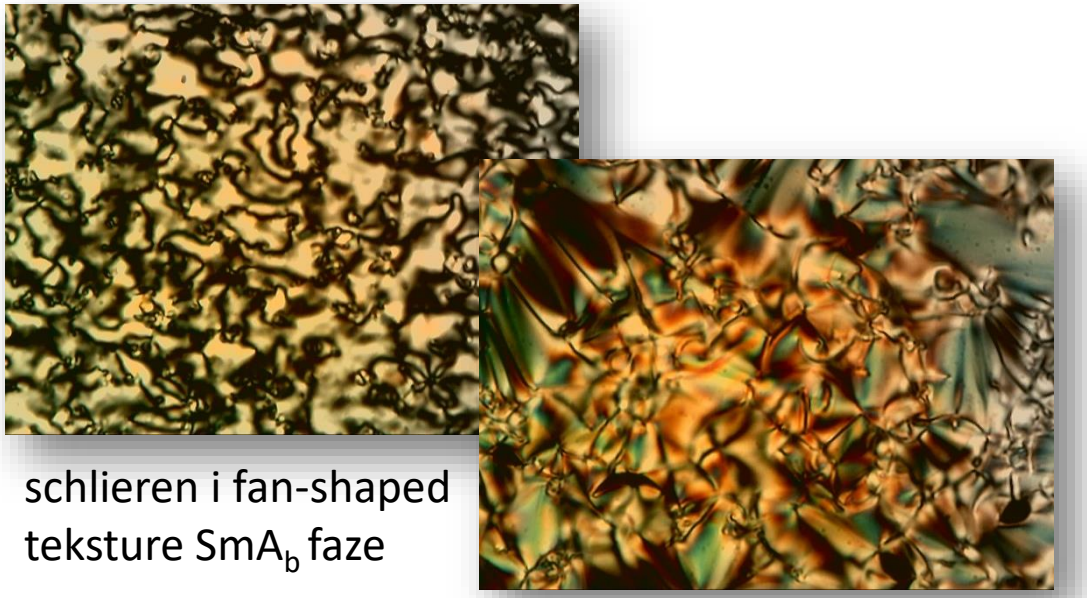


Mozaična tekstura kolonske heksagonalne (Col_h) faze.

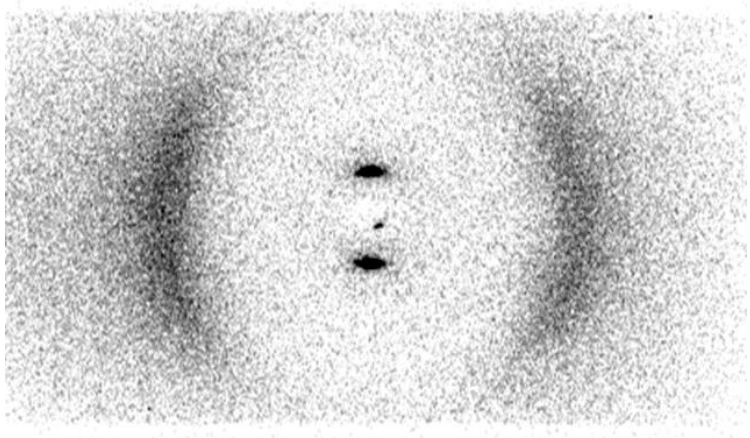
Mikrosegregacija

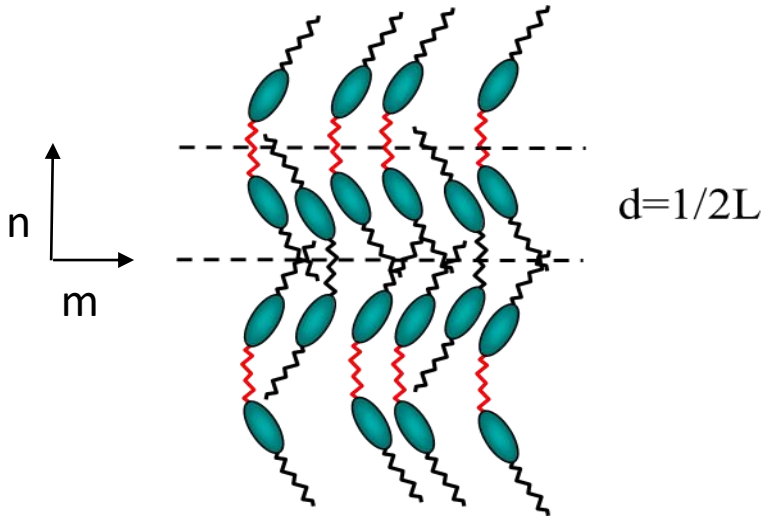
SmA_b faza





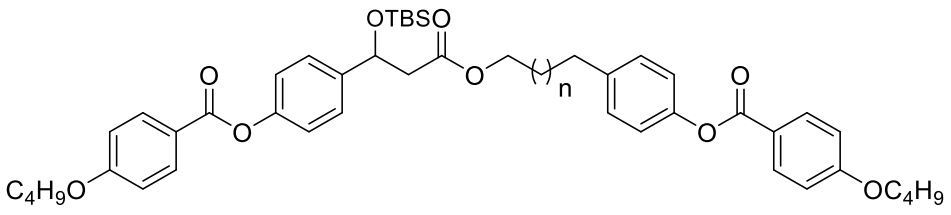
schlieren i fan-shaped tekstura SmA_b faze

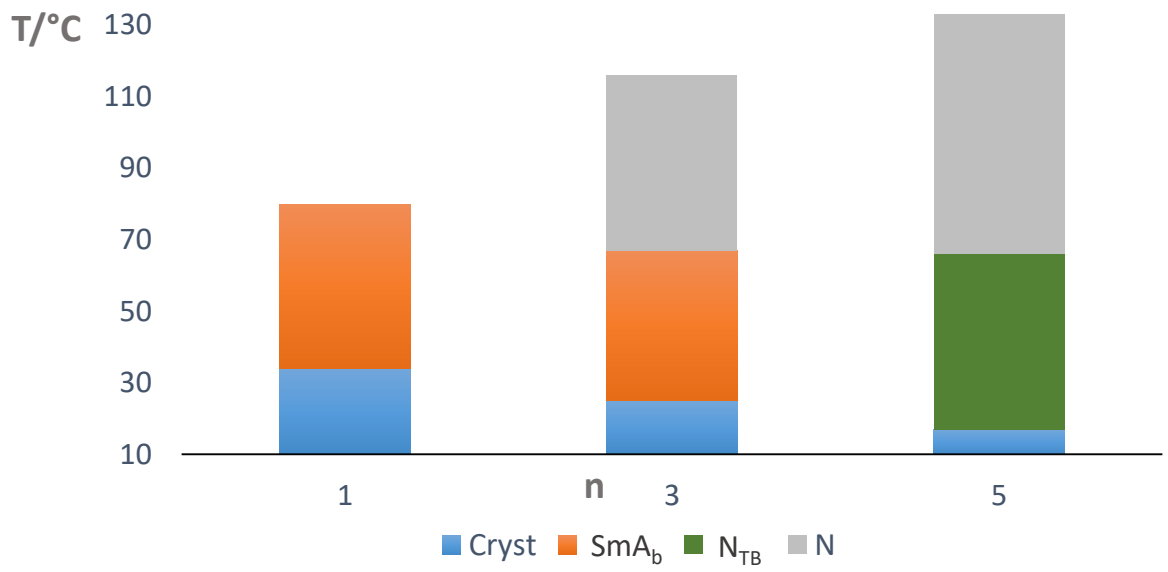


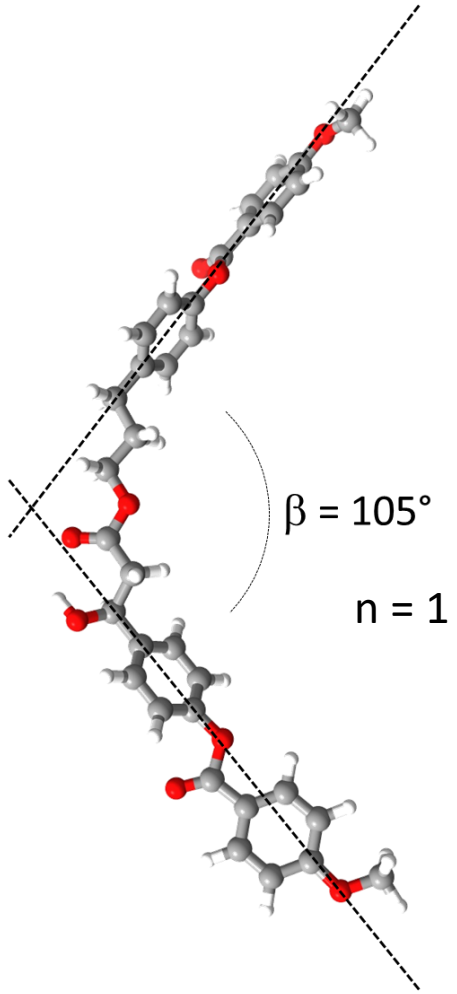


C. Meyer, P. Davidson, D. Constantin, V. Sergan, D. Stoenescu, A. Knezevic, I. Dokli, A. Lesac, I. Dozov, *Phys. Rev. X* **11**, 03102.

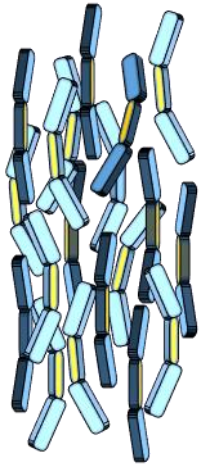
Utjecaj duljine razmaknice





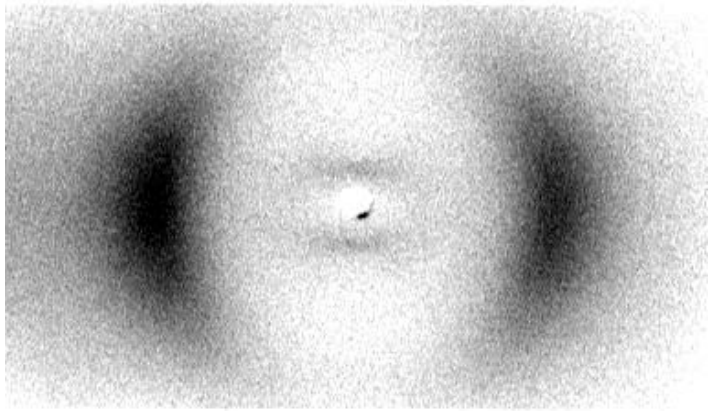


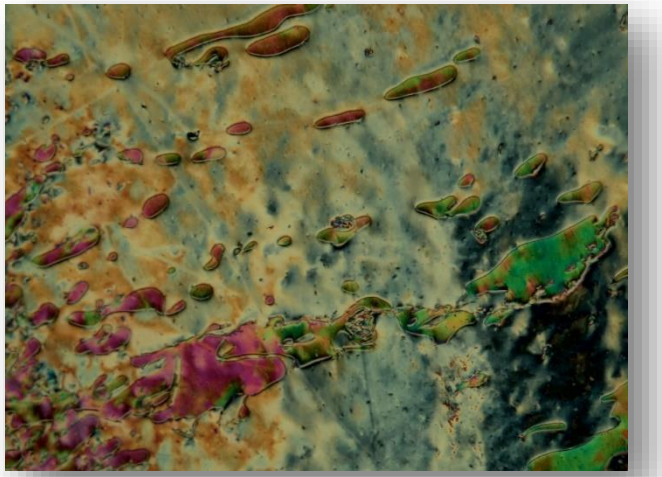
Nematička (N) i twist-bend (N_{TB}) faza

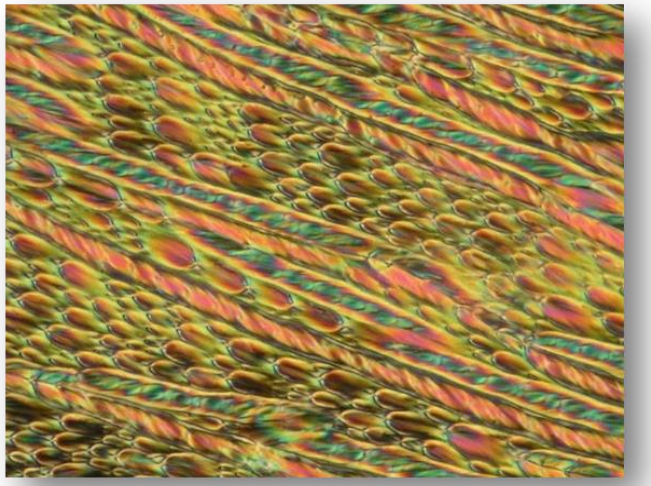


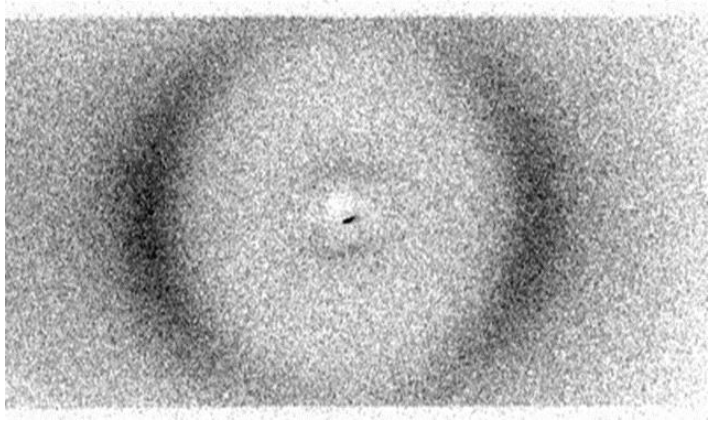
nematička faza

N_{TB} faza

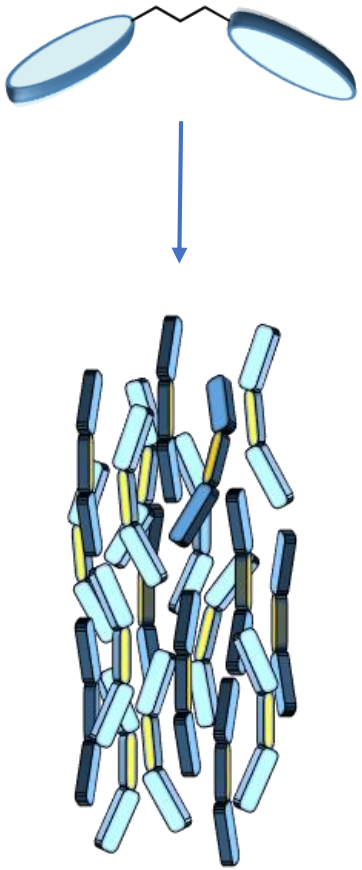




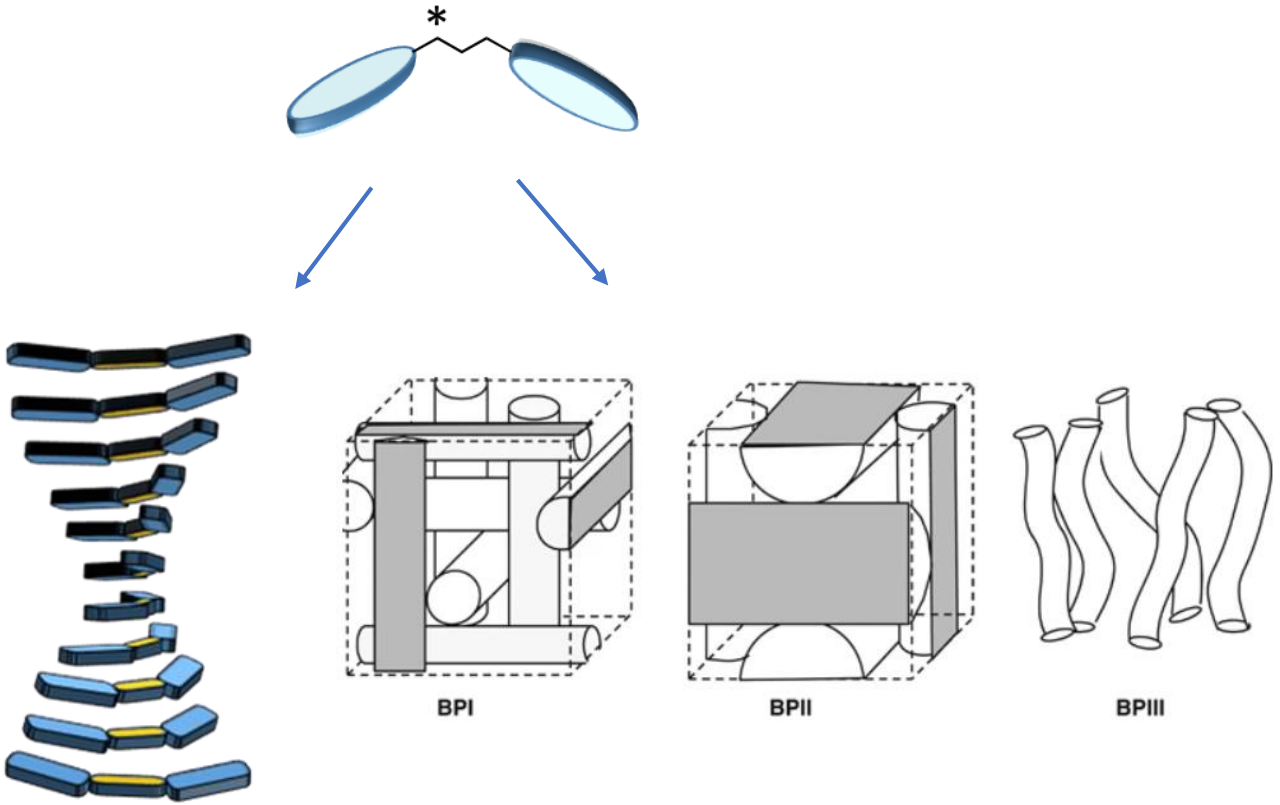




Utjecaj kiralnosti

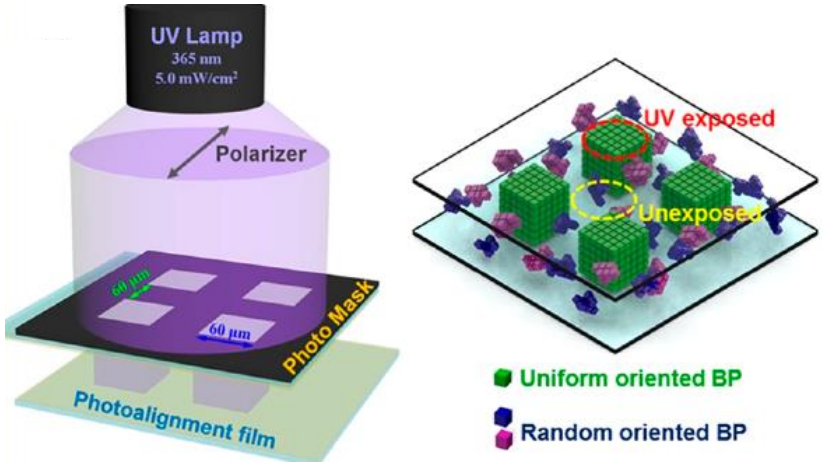


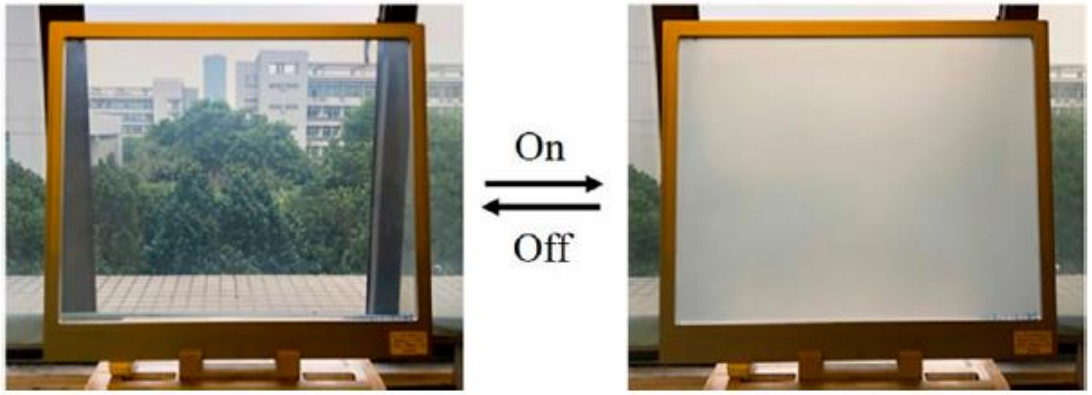
nematiča faza



kiralna nematička faza (N*)

Primjena kiralnih LC-a

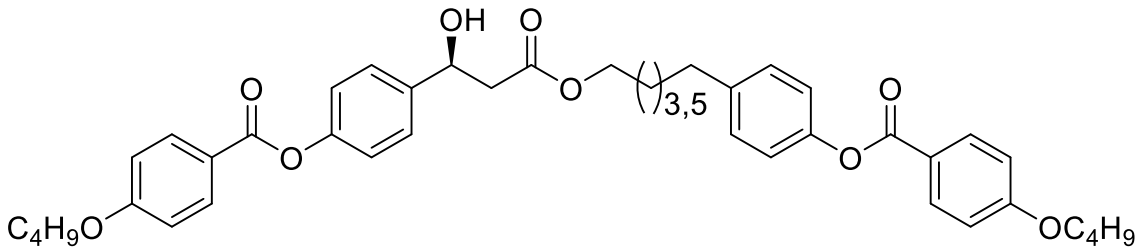




- prisutna u mnogim biološkim sustavima
- moguća primjena za lasere, senzore, fotozaslone, pametne prozore,…

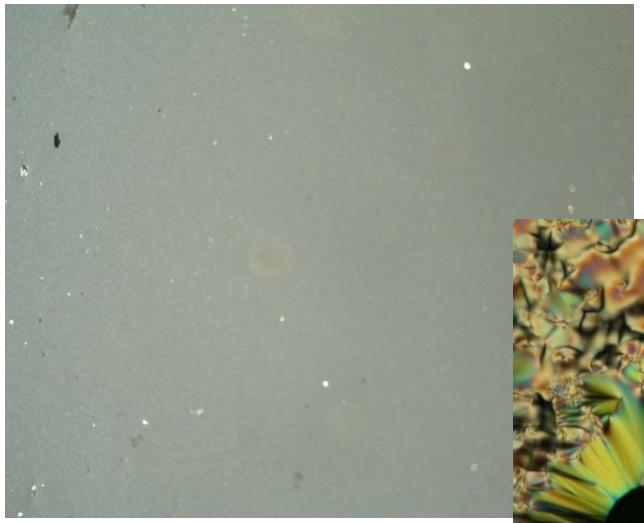
Hari Krishna Bisoyi, Quan Li, *Chemical Reviews* **2022** *122* (5), 4887-4926

Utjecaj kiralnosti

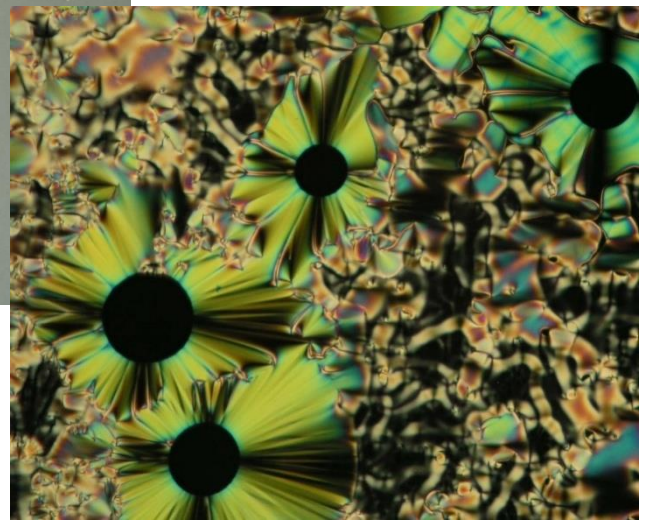


n = 3

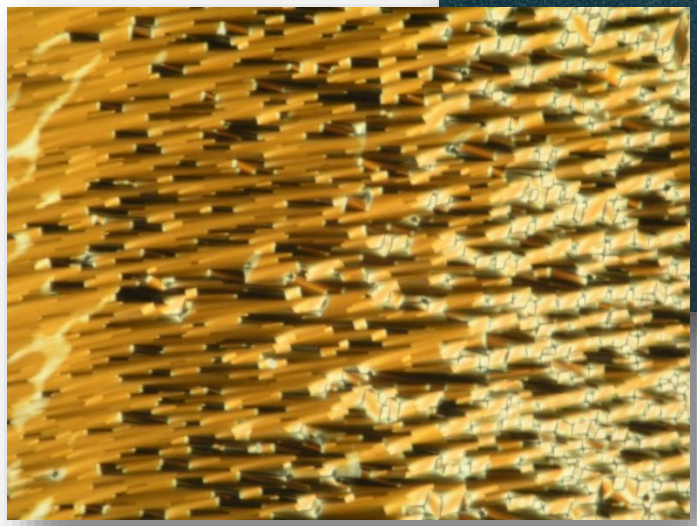
n = 5



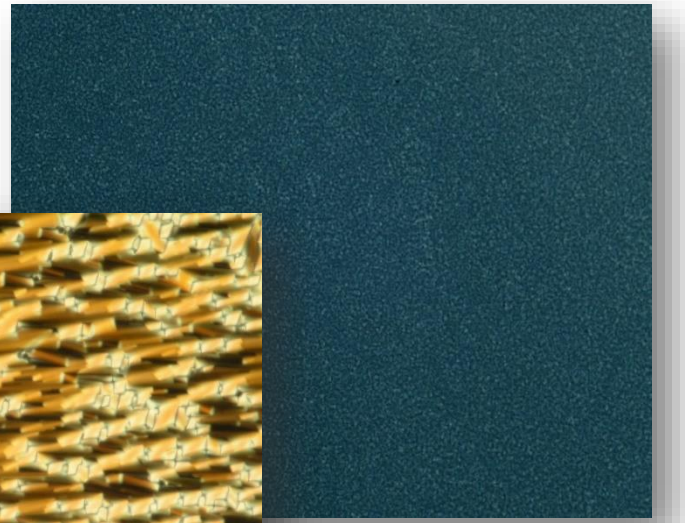
BPIII



SmA_b*

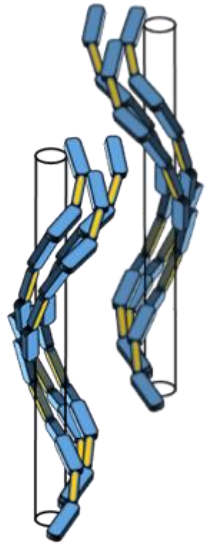


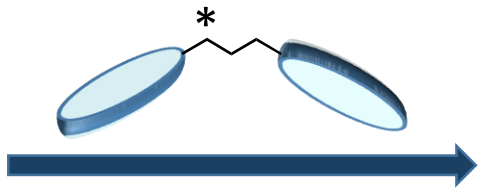
N_{TB}*



N*

Nastavak istraživanja





N_{TB} faza s jednom domenom ?

Hijerarhijska kiralna superstruktura ?

Laboratorij za stereoselektivnu sintezu i biokatalizu

Autori zahvaljuju Hrvatskoj zakladi za znanost [IP-2019-04-7978 i DOK-2020-01] za financijsku potporu.

Strukturna kiralnost vs molekulska kiralnost (SMChiral)

Hvala na pozornosti!