



Sveučilište u Zagrebu
Prirodoslovno-matematički fakultet
Kemijski odsjek



SELEKTIVNA OKSIDACIJA BENZILNOG ALKOHOLA I NJEGOVIH DERIVATA UZ PRIMJENU RAZLIČITIH KATALIZATORA

Kemijski seminar 1

Izrađen prema radu:

M. M. Heravi, N. Ghalavand, E. Hashemi, *Chemistry* **2** (2020) 101–178.

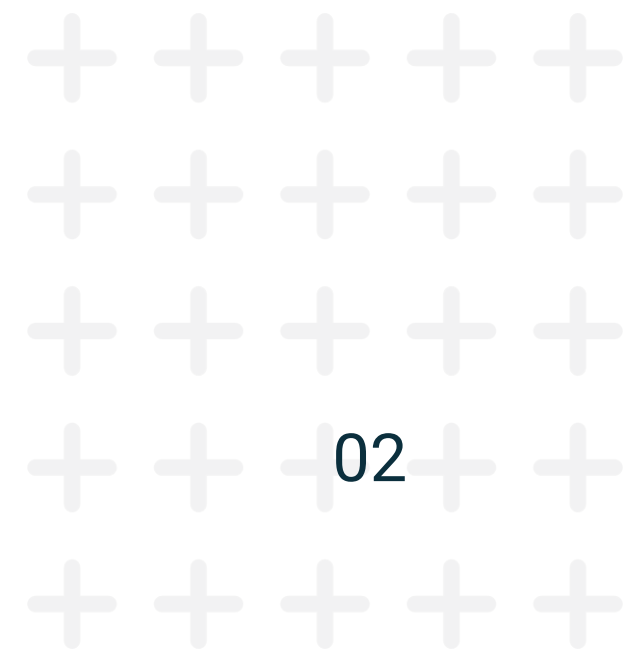
Josipa Sarjanović

Doktorski studij Kemija - Anorganska i strukturna kemija

02.04.2025.

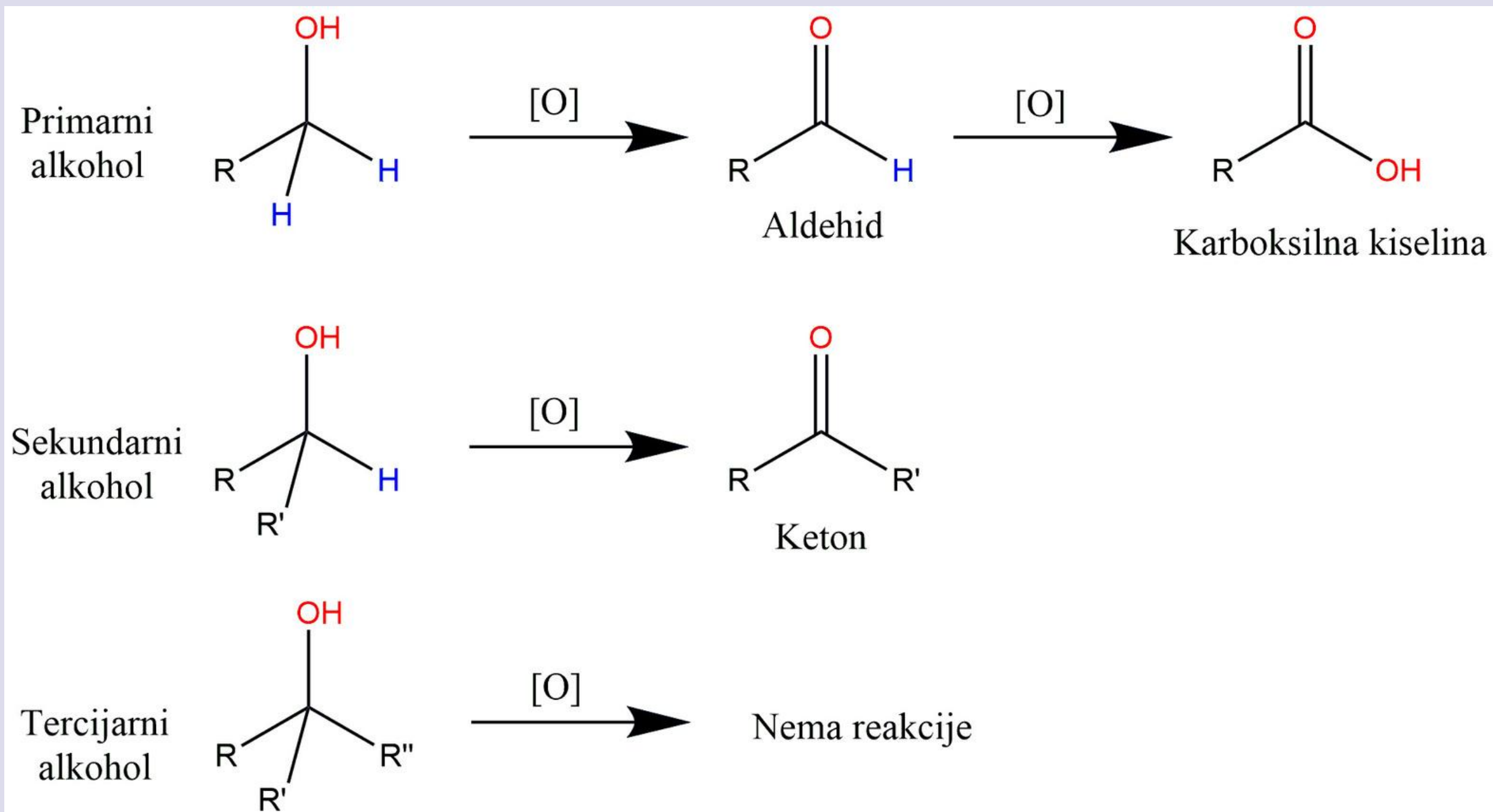


1. Oksidacija alkohola
2. Parametri katalitičkih reakcija
3. Benzilni alkohol
4. Derivati benzilnog alkohola
5. Zaključak





OKSIDACIJA ALKOHOLA



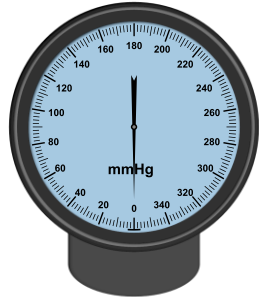
PARAMETRI KATALIZE



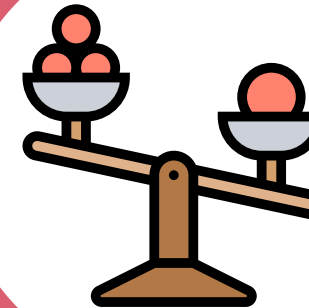
AKTIVNA POVRŠINA KATALIZATORA



TEMPERATURA



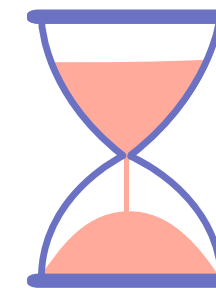
TLAK



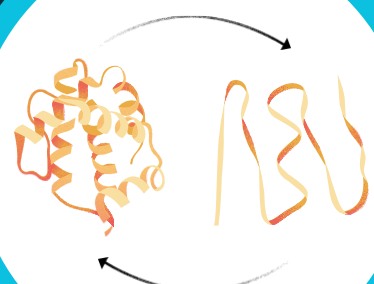
KONCENTRACIJA REAKTANTA /
KATALIZATORA



VRSTA OKSIDANSA



VRIJEME REAKCIJE



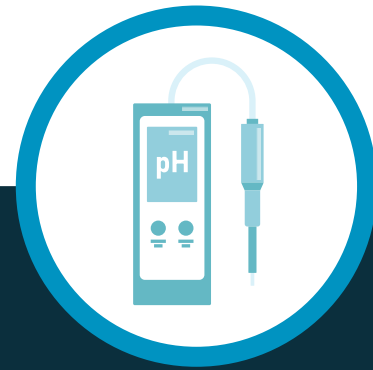
INHIBITORI / PROMOTORI



HOMOGENI / HETEROGENI
KATALIZATORI



Vodikov peroksid



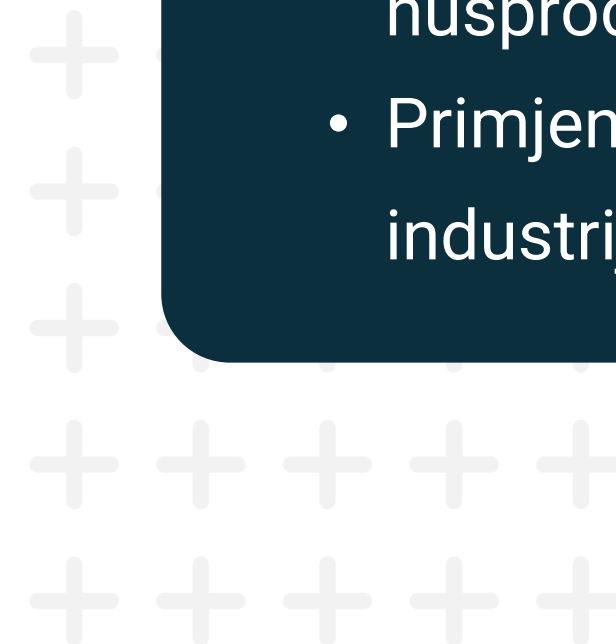
Djelovanje pri pH
vrijednosti sedam



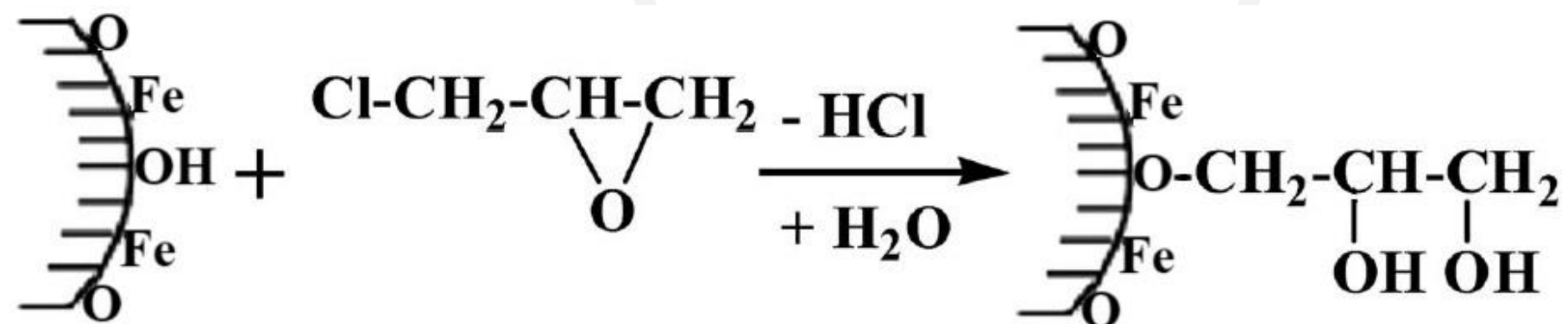
Razgradnja na vodu i kisik

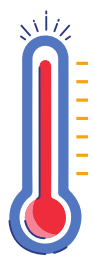


- Visoka selektivnost
- Manje štetnih nusprodukata
- Primjena u različitim industrijama



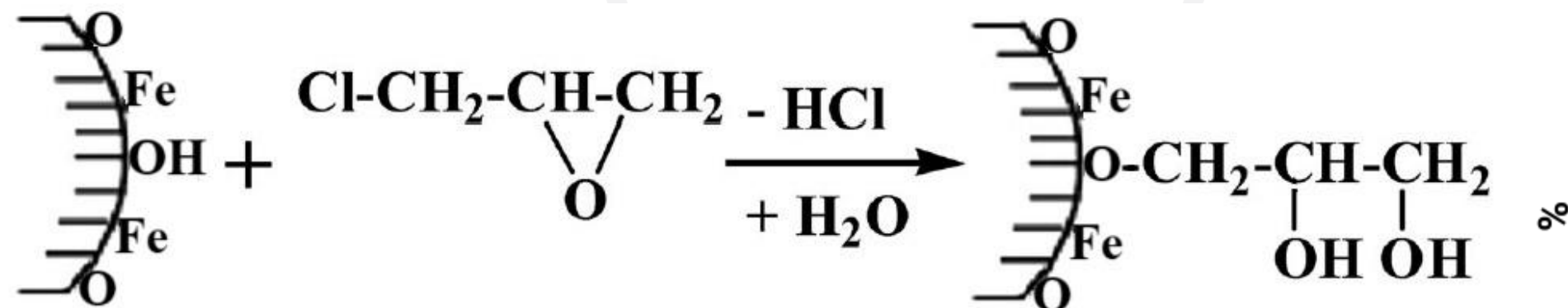
Fe₃O₄-ECH-D





TEMPERATURA

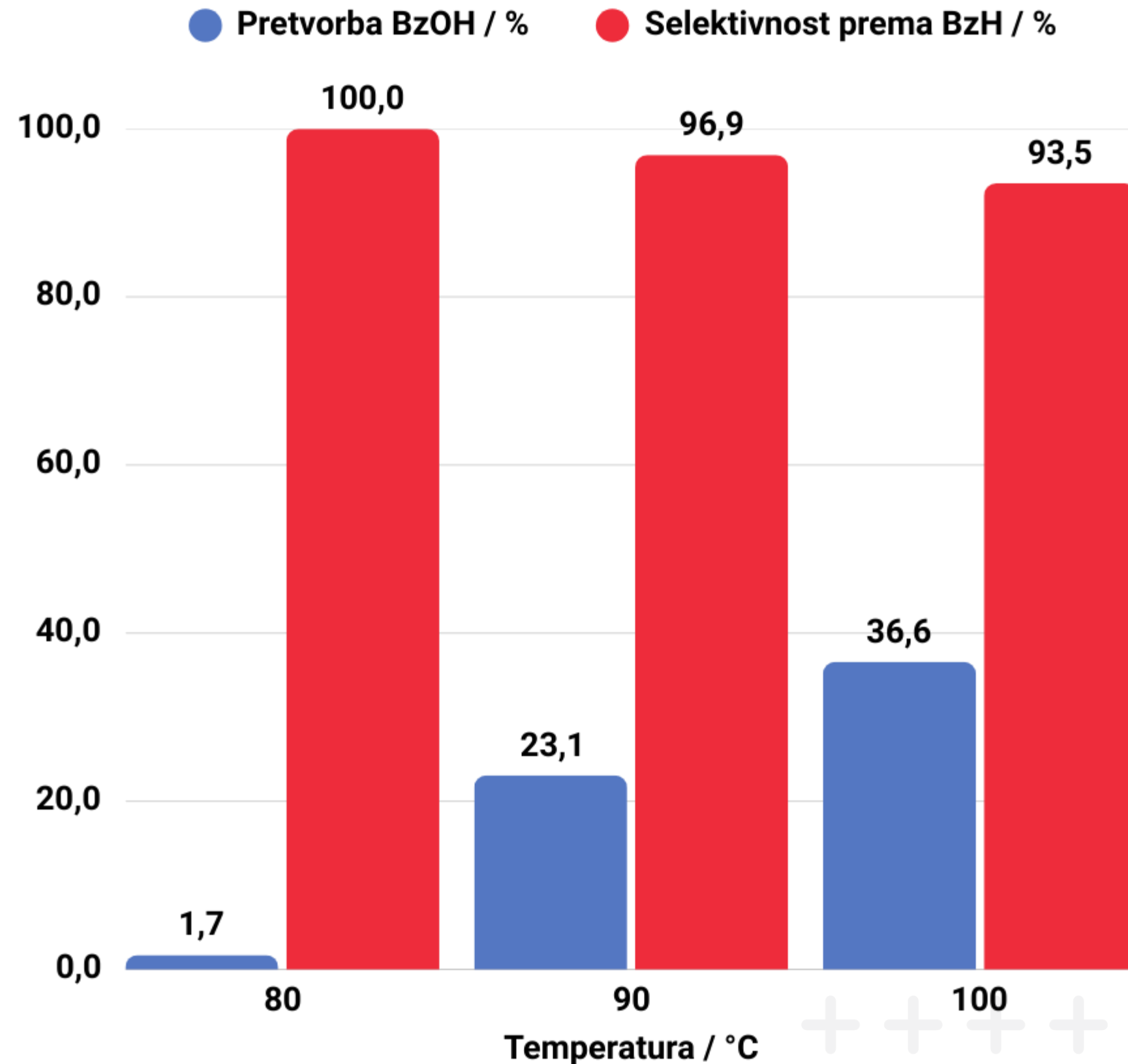
Fe₃O₄-ECH-D

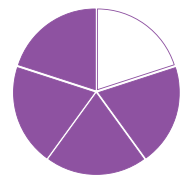


Uvjeti reakcije:

BzOH (40 mmol), katalizator (0,2 g),

H₂O₂ (80 mmol), H₂O (8 mL), 1,5 h





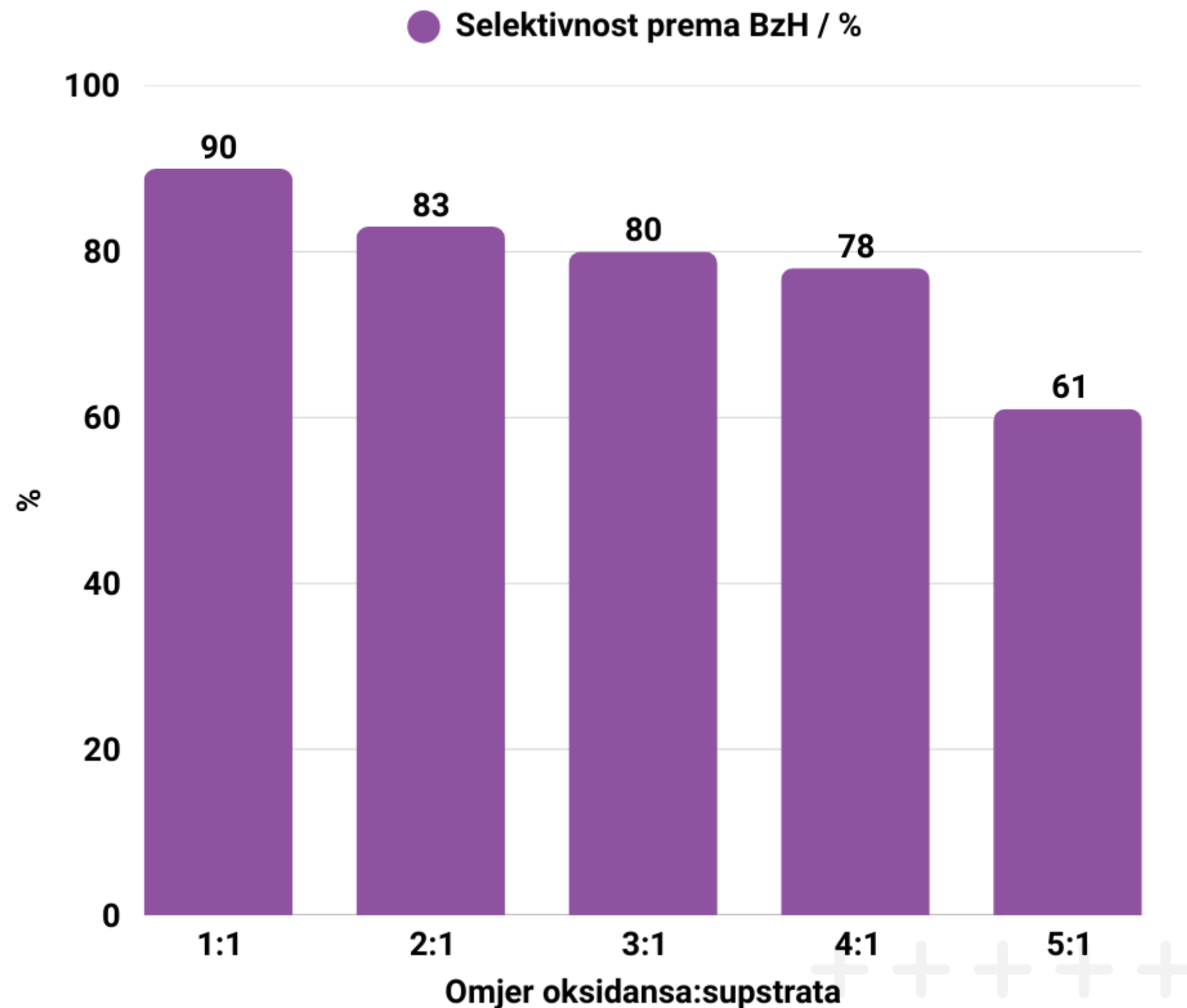
OMJER OKSIDANSA I SUPSTRATA



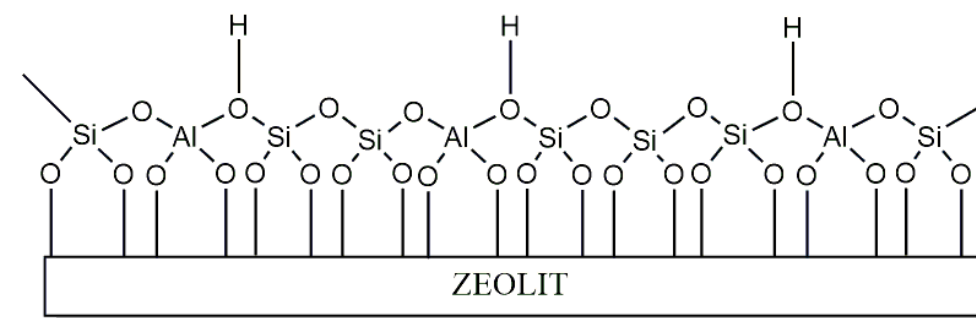
Pretvorba BzOH 95 - 100 %

Uvjeti reakcije:

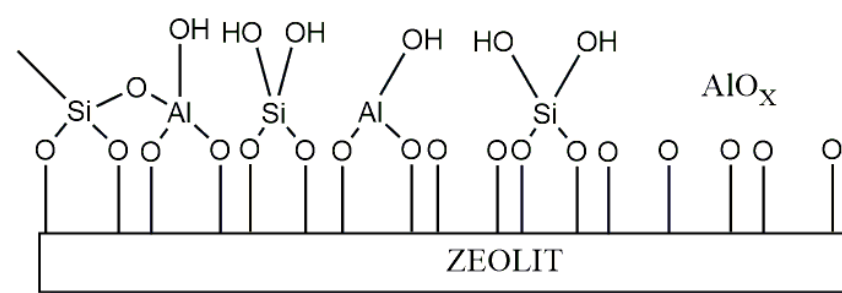
BzOH (1 mmol), katalizator (0,0015 mmol),
H₂O₂ (30 %), H₂O (3 mL), 90 °C, 6 h

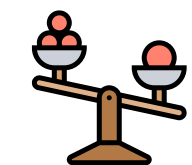


25ZSM(AT-0,5)



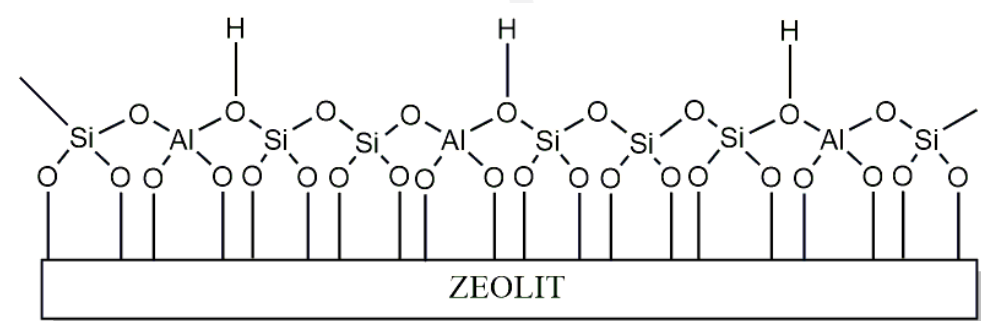
Lužnati tretman



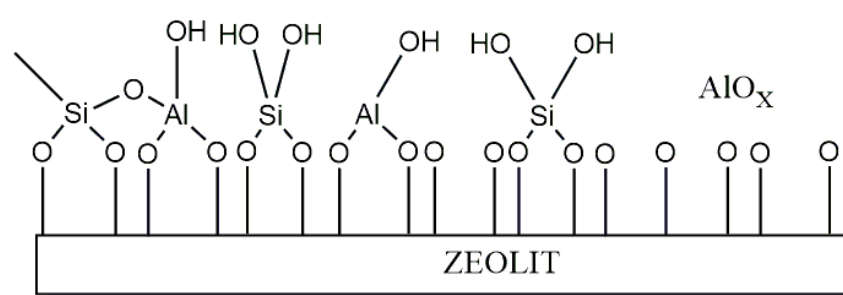


KOLIČINA KATALIZATORA

25ZSM(AT-0,5)

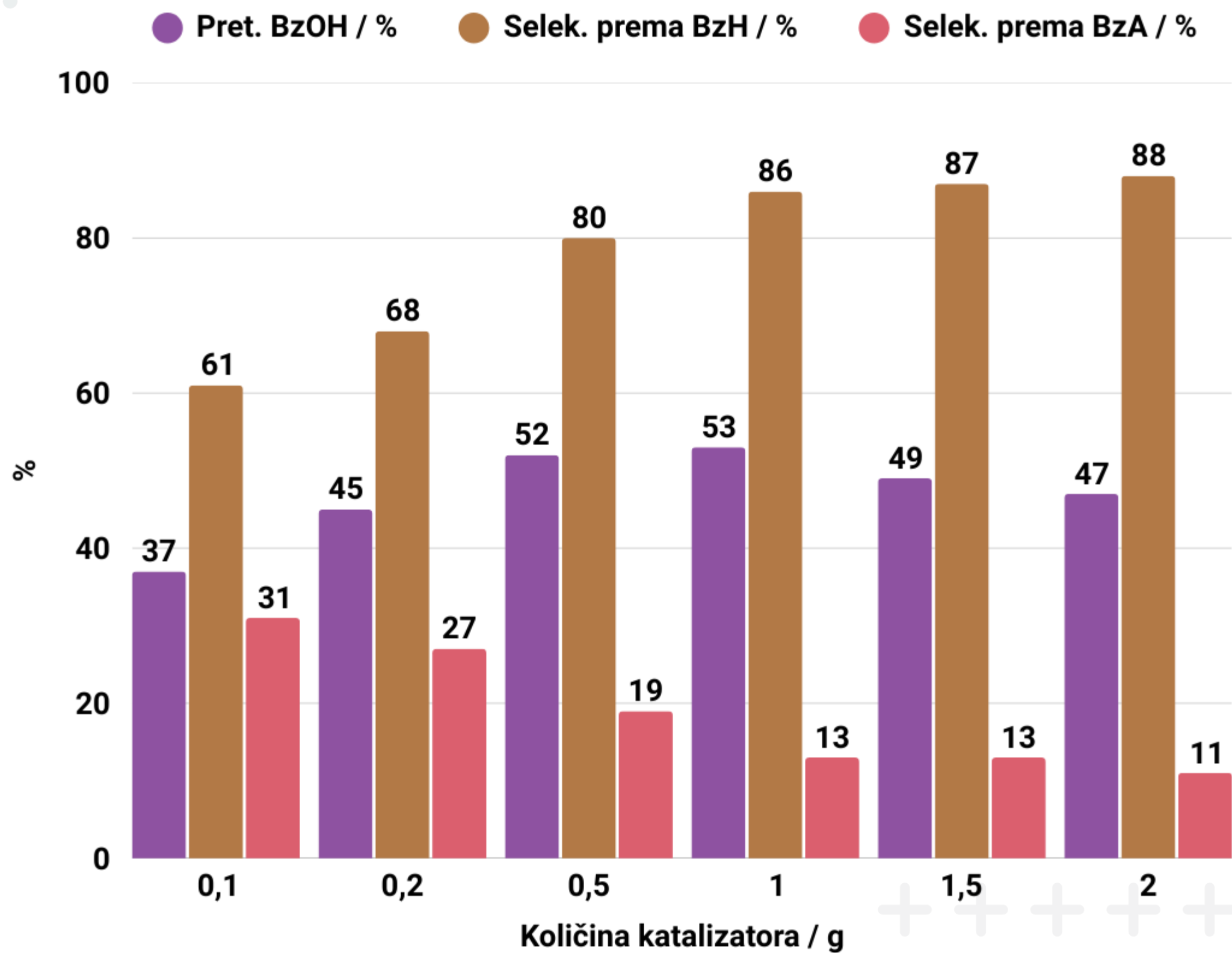


Lužnati tretman

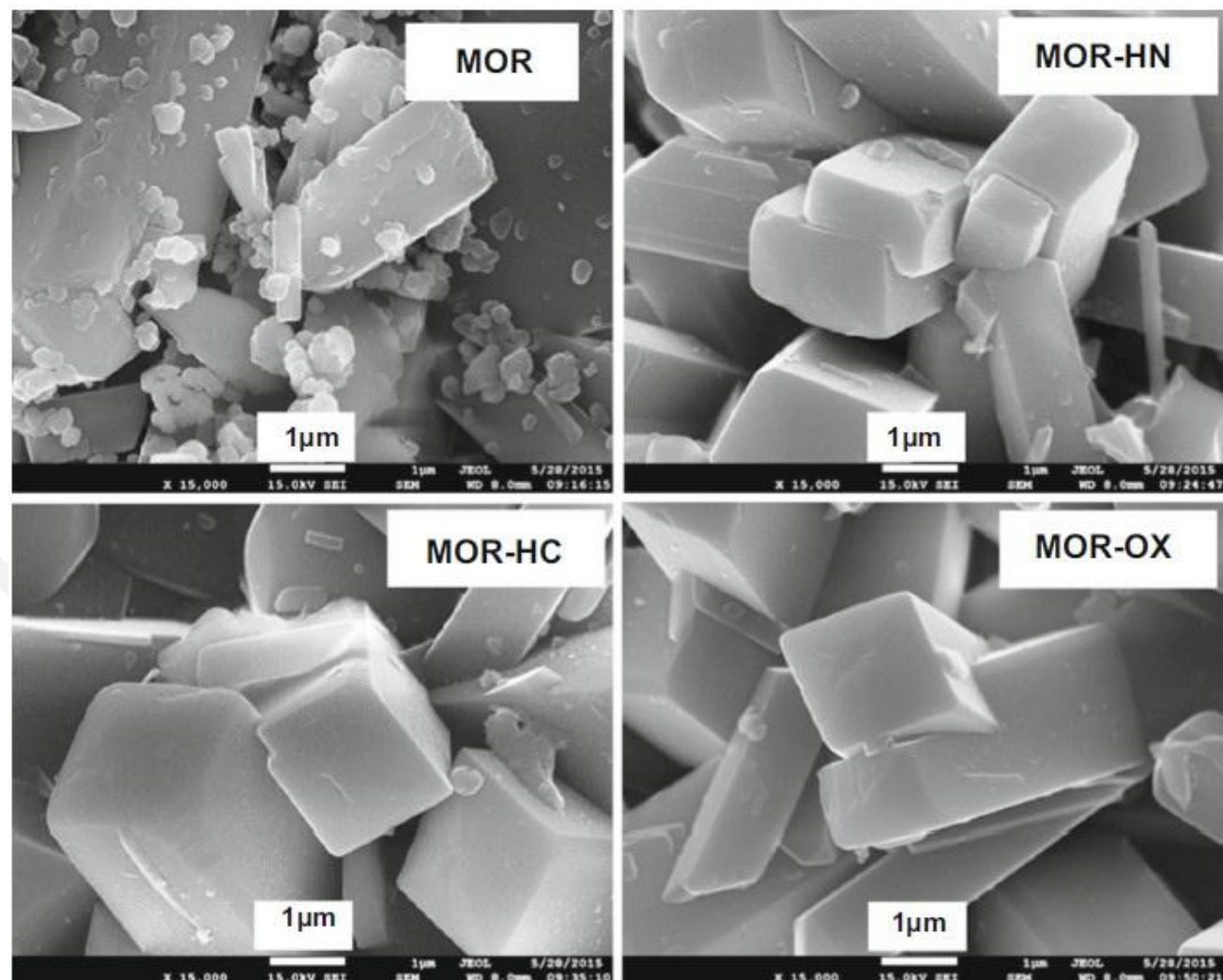


Uvjeti reakcije:

katalizator (0,1 – 2 g), H₂O₂/BzOH (1:3),
deionizirana H₂O (26 mL), refluks, 4 h

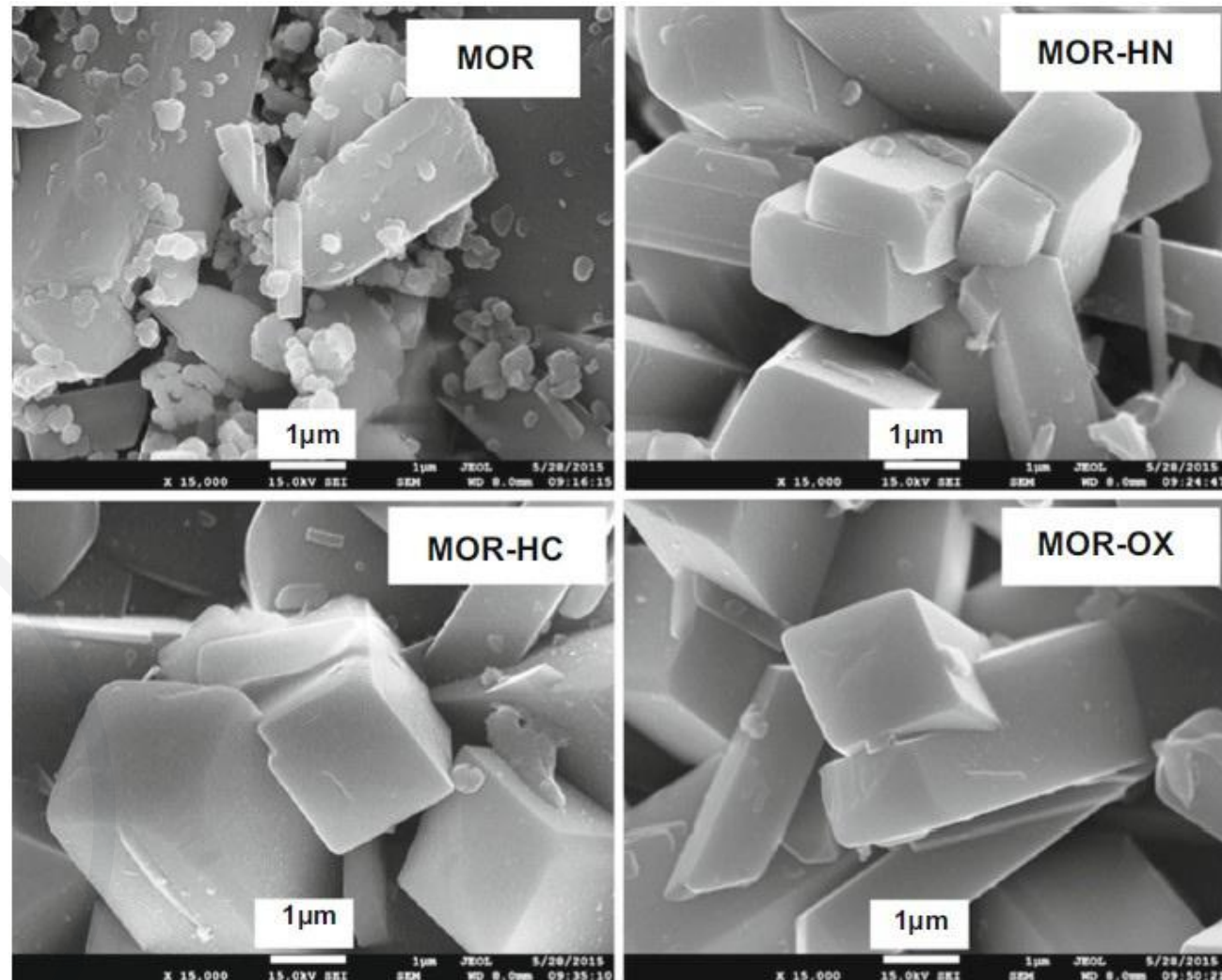


MOR + promjene



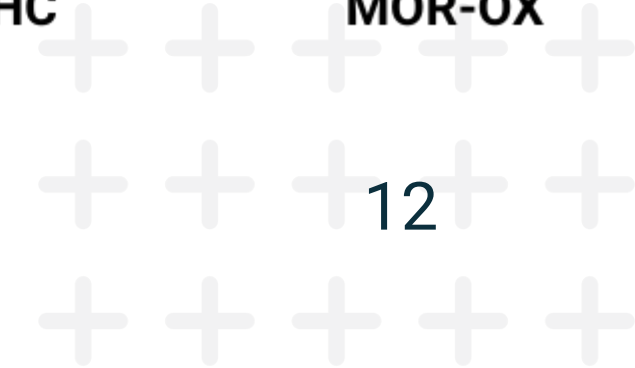
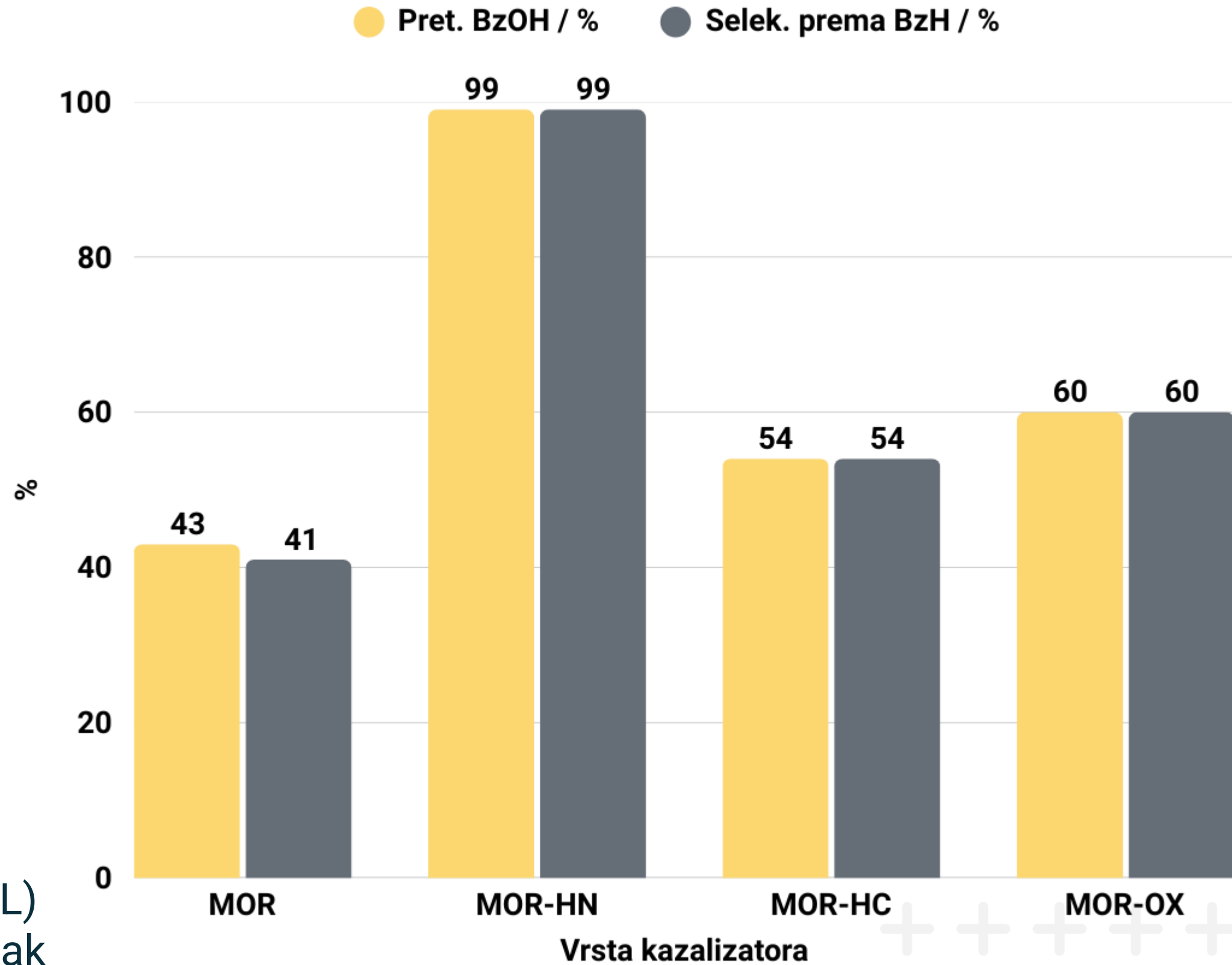


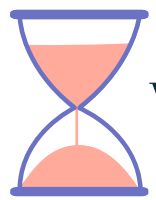
MOR + promjene



Uvjeti reakcije:

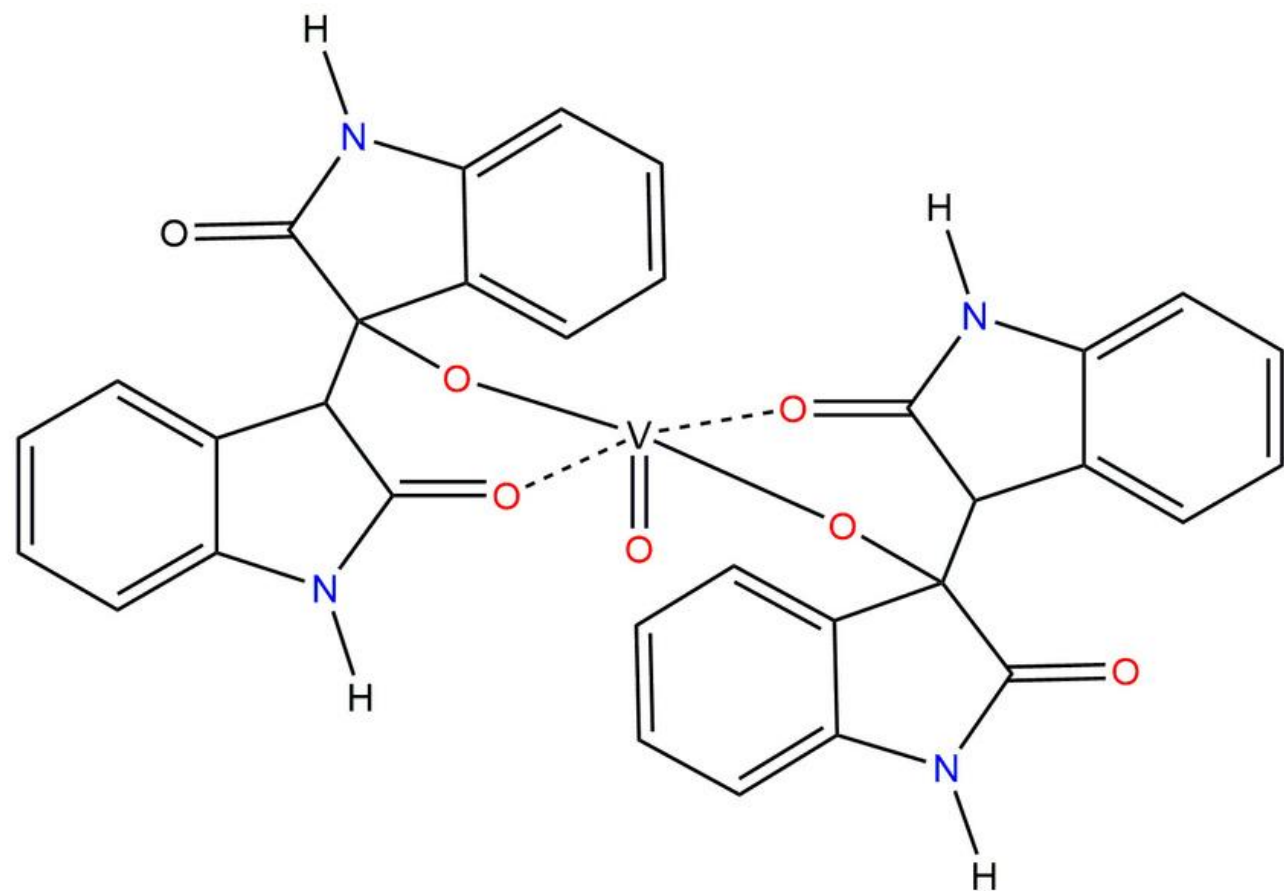
katalizator (0,5 g), BzOH (14 mL), H₂O₂ (30 %, 13 mL)
deionizirana H₂O (26 mL), 90 °C, 4 h, atmosferski tlak





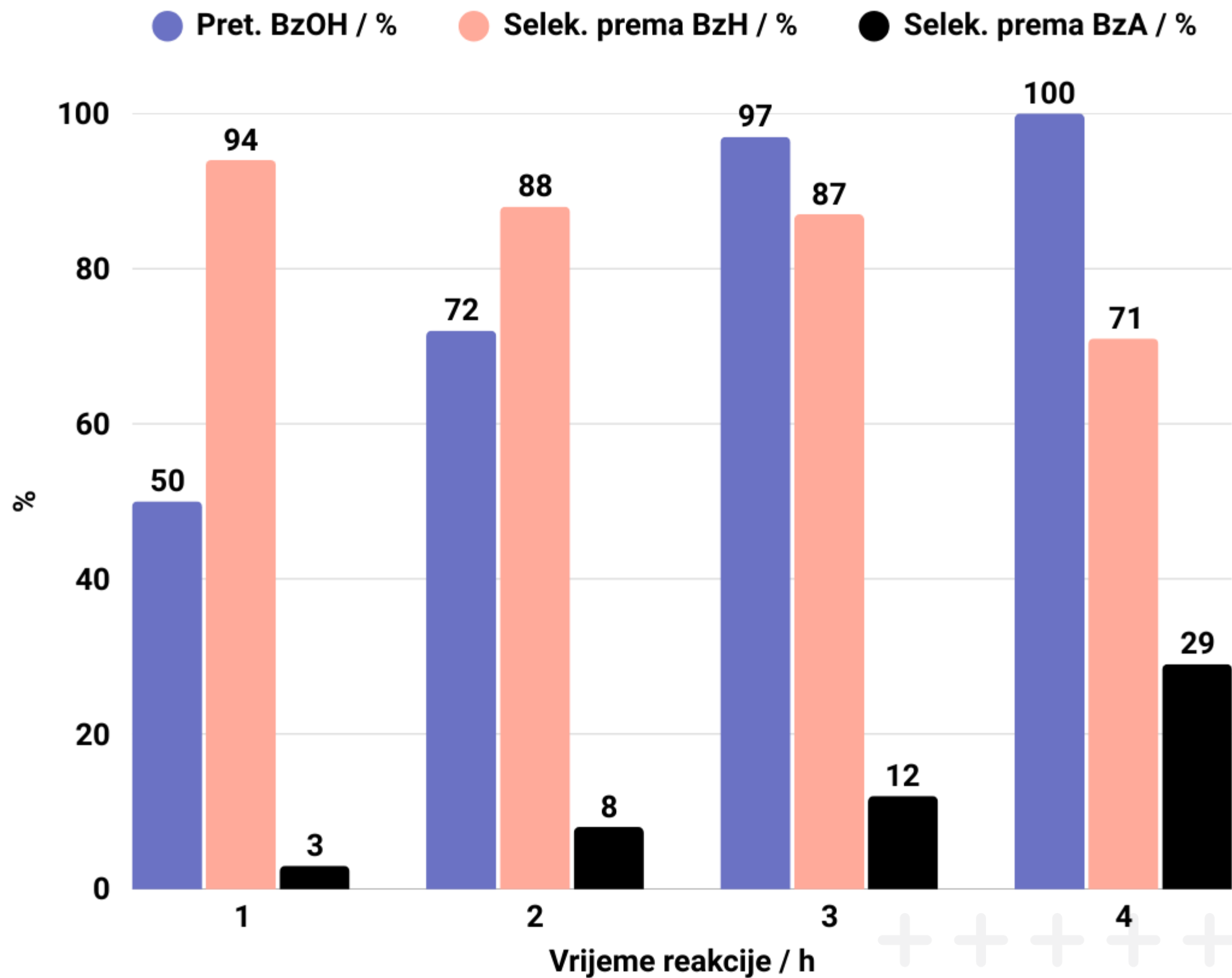
VRIJEME

[VOH₂ID]

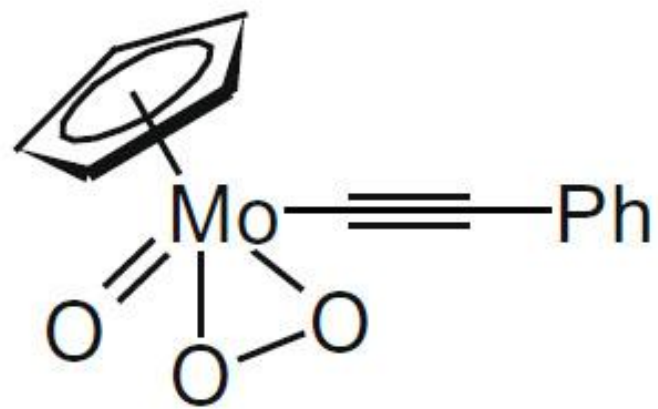


Uvjeti reakcije:

BzOH (1 mmol), [VOH₂ID] (0,02 mmol),
H₂O₂ (3 mmol), CH₃CN (10 mL), 85 °C

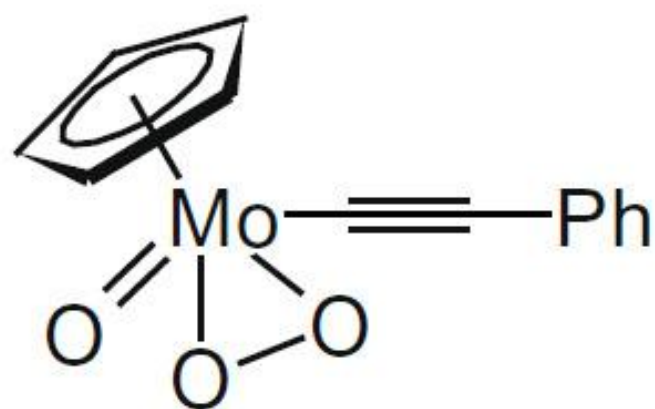


[CpMo(CO)₃(CC≡Ph)]



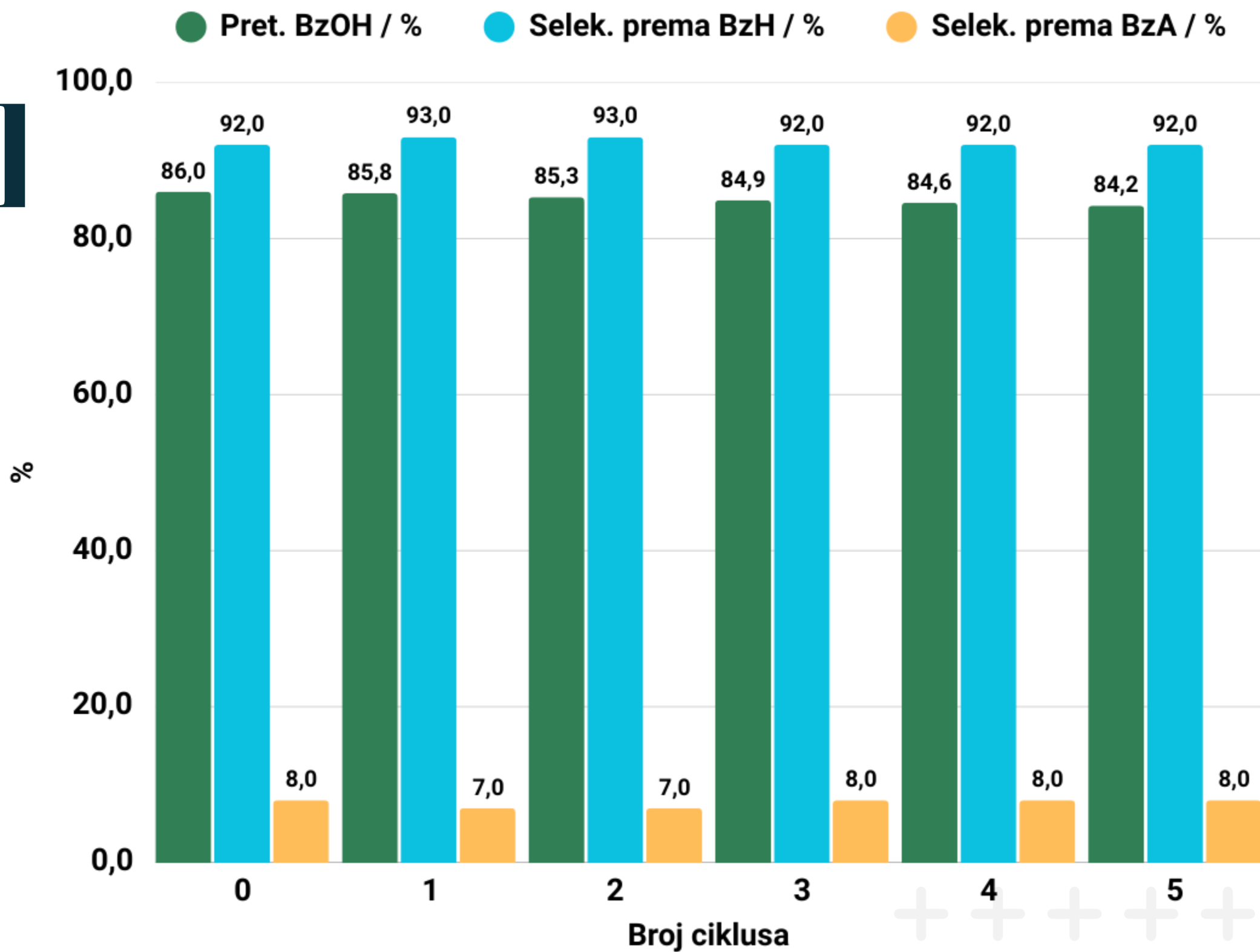


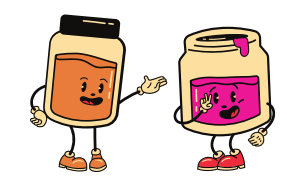
RECIKLIRANJE KATALIZATORA



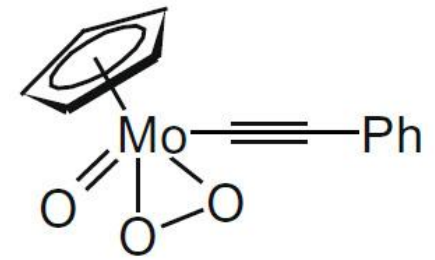
Uvjeti reakcije:

BzOH (0,05 mol), $[\text{CpMo}(\text{CO})_3(\text{CC}\equiv\text{Ph})]$ (0,1 mmol),
 H_2O_2 (0,1 mol), 8 h, 80 °C



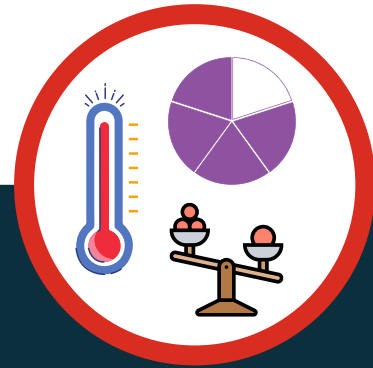


DERIVATI BENZILNOG ALKOHOLA



Uvjeti reakcije:
BzOH (0.05 mol),
[CpMo(CO)₃(CC≡Ph)]
(0,1 mmol),
H₂O₂ (0,1 mol),
8 h, 80 °C

Supstrat	Pret. alkohola / %	Selek. prema aldehidu / %	Selek. prema kisellini / %
	86	92	8
	90	87	13
	90	90	10
	83	85	15
	60	88	12
	65	91	9
	78	90	10



Viša temperatura = veća pretvorba BzOH, minimalno smanjenje selektivnosti

Veći omjer oksidansa i supstrata = manja selektivnost

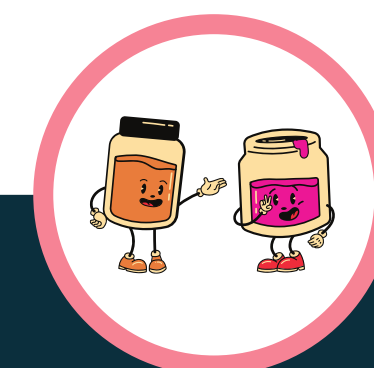
Veća količina katalizatora = prvotno veća pretvorba BzOH, a zatim smanjenje pretvorbe; veća selektivnost prema BzH



Promjene katalizatora = ovisno o promjeni pozitivan / negativan učinak

Duže vrijeme reakcije = veća pretvorba BzOH, ali manja selektivnost prema BzH

Mogućnost recikliranja homogenog katalizatora tijekom pet ciklusa



Elektron-donirajuće skupine = povećanje pretvorbe BzOH i selektivnosti prema BzH

Elektron-odvlačeće skupine = smanjenje pretvorbe BzOH i minimalan utjecaj na selektivnost prema BzH



HVALA
NA PAŽNJI!

