Kompoziti polidimetilsiloksana

R. Ariati *et al*. Polydimethylsiloxane Composites Characterization and Its Application: A Review, *Polymers* **2021**, 13, 4258.

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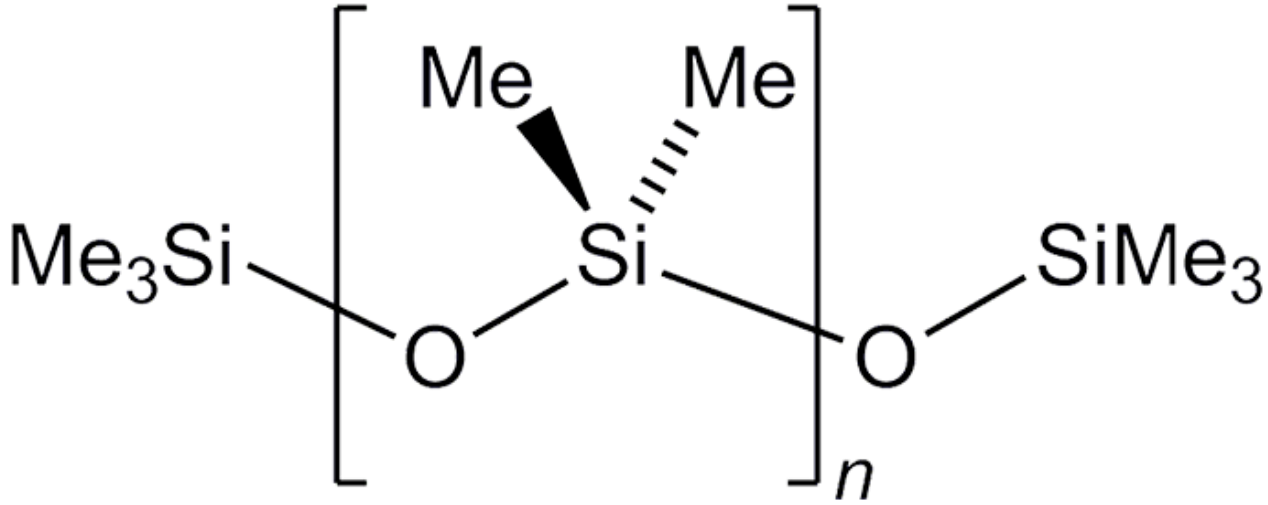
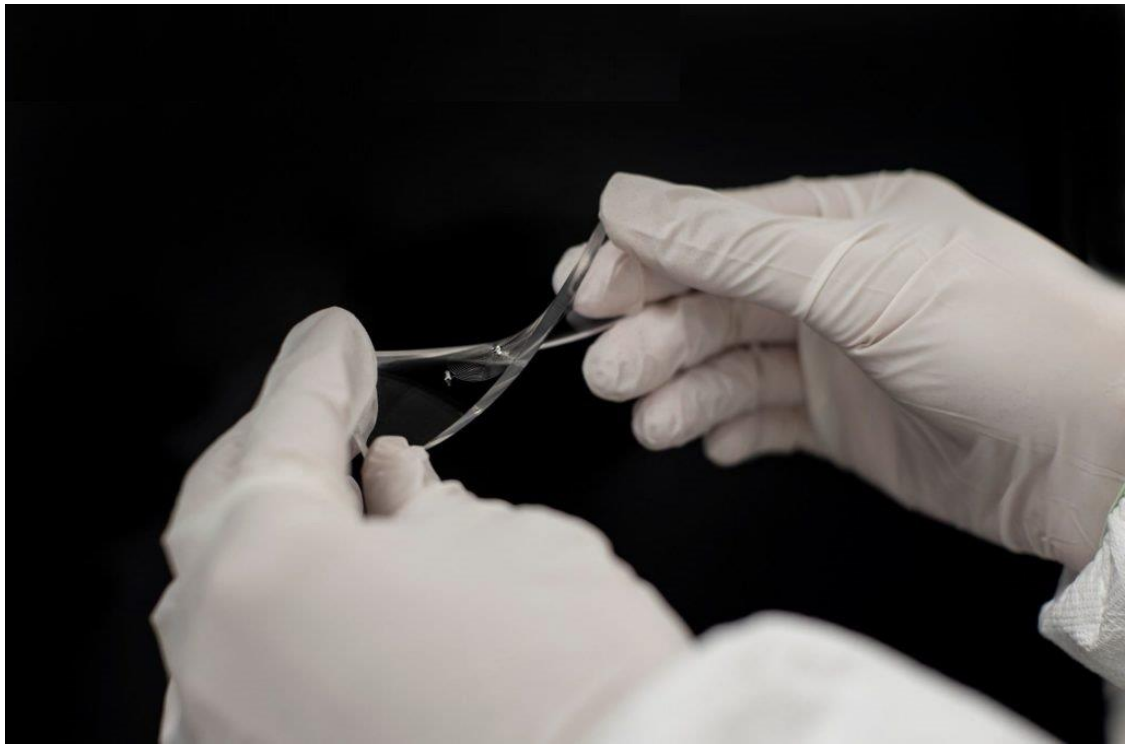
SADRŽAJ

O polidimetilsiloksanu (PDMS)

- Elastomer koji pripada grupi silikona



Slika 1. Strukturni prikaz molekule polidimetilsiloksana.



Slika 2. Savijanje polidimetilsiloksana rukama.

- Proziran, fleksibilan, biokompatibilan, kemijski i termički stabilan 🤩
- Mehanička svojstva (mali modul elastičnosti, čvrstoća) 😭 → aditivi 🤔?

[1] Ariati R. et al. Polydimethylsiloxane Composites Characterization and Its Application: A Review, Polymers 2021, 13, 4258.
[2] https://www.acs.org/content/acs/en/molecule-of-the-week/archive/p/polydimethylsiloxane.html
[3] https://www.ufluidix.com/microfluidic-technical-knowledgebase/materials-for-microfabrication/

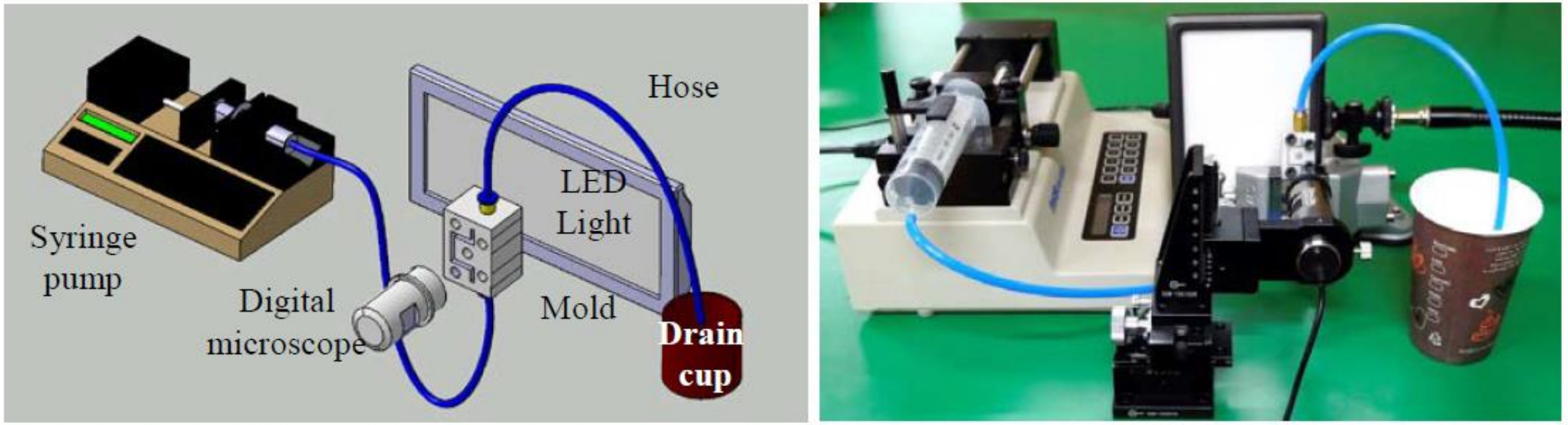
ADITIVI POLIDIMETILSILOKSANA: PODJELA

- Vlakna i nanovlakna kao ojačala: karbonska, SiO_2 vlakna, najlonska…
- Čestice kao aditivi: metalne č. magnetskih svojstava, ugljikove nanocjevi…
- Voskovi kao aditivi: parafinski, pčelinji…
- Drugi polimeri

[1] Ariati R. et al. Polydimethylsiloxane Composites Characterization and Its Application: A Review, Polymers 2021, 13, 4258.

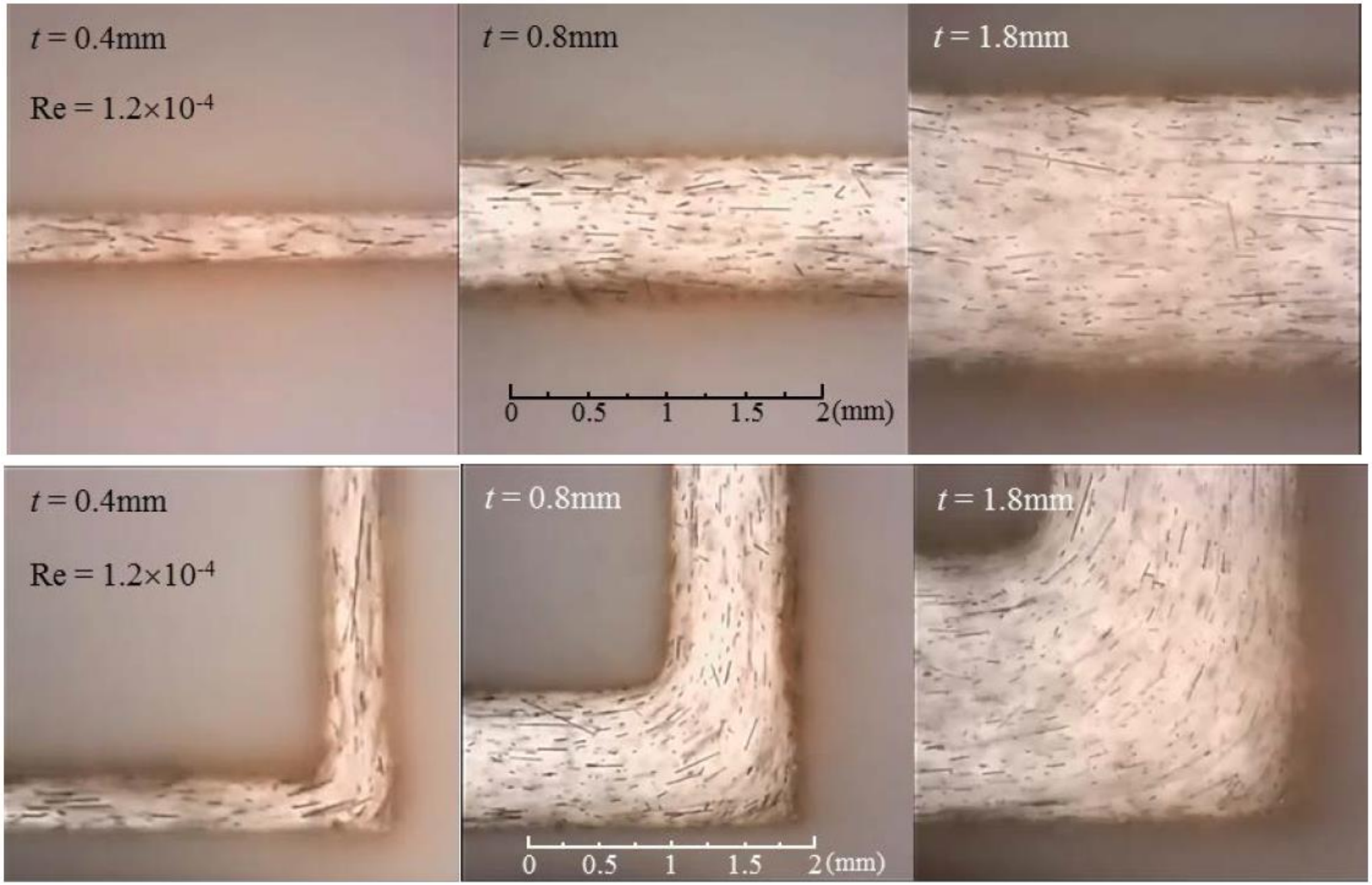
VLAKNA I NANOVLAKNA KAO OJAČALA

- Istraživanja s raznim vlaknima, ali se distribucija vlakana teško kontrolira
- Oh i Park (2017): PDMS + vlakna



Slika 3. Grafički prikaz i fotografija eksperimentalnog postava.

[4] Oh D. W., Park J. Y. Simulation of Fiber Alignment during the Injection Molding Process by Using Short Carbon Fiber and Pdms Mixture; Department of Mechanical Engineering, Chosun University, International Committee on Composite Materials: Gwangju, Korea, 2017.



Slika 4. Poravnavanje karbonskih vlakana u polidimetilsiloksanu u strujanjem kroz ravni kanal (gore) i koljenasti kanal od 90° (dolje), gdje su *t* širine kanala, *R*e je Reynoldsov broj koje je jednak je za tri kanala.

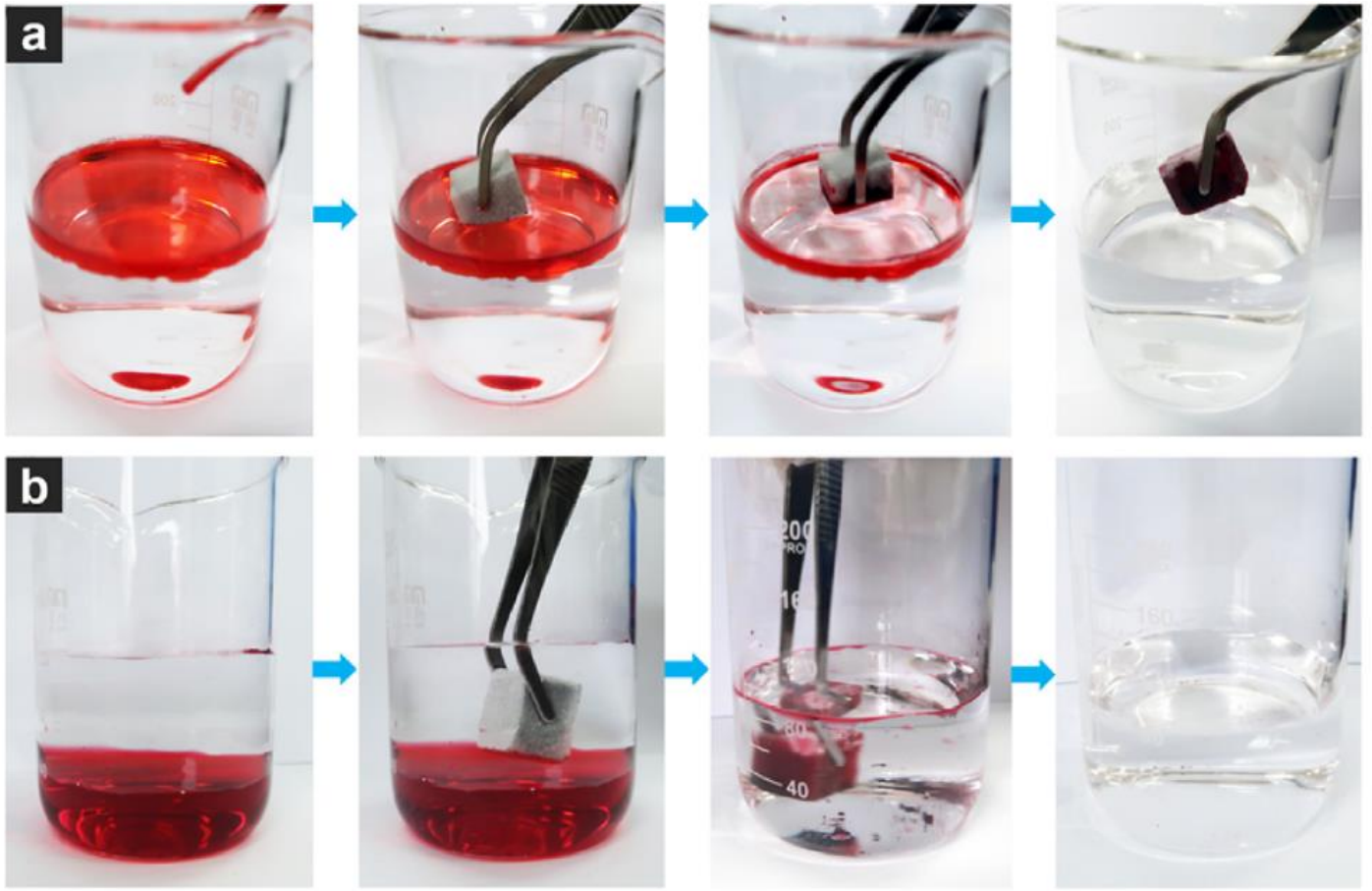
[4] Oh D. W., Park J. Y. Simulation of Fiber Alignment during the Injection Molding Process by Using Short Carbon Fiber and Pdms Mixture; Department of Mechanical Engineering, Chosun University, International Committee on Composite Materials: Gwangju, Korea, 2017.

ČESTICE KAO ADITIVI

- PDMS+čestice: efikasnost u apsorpciji određenih kapljevina iz otpadnih voda
- Hidrofobni, porozni i netoksični
- "spužve" → poroznost ~ 1/veličina čestica
- velike čestice se bolje vežu

- PDMS/SiO_2/WS_2 →
- Apsorpcija 21-112 * m(spužva)
- Efikasnost > 99 %.

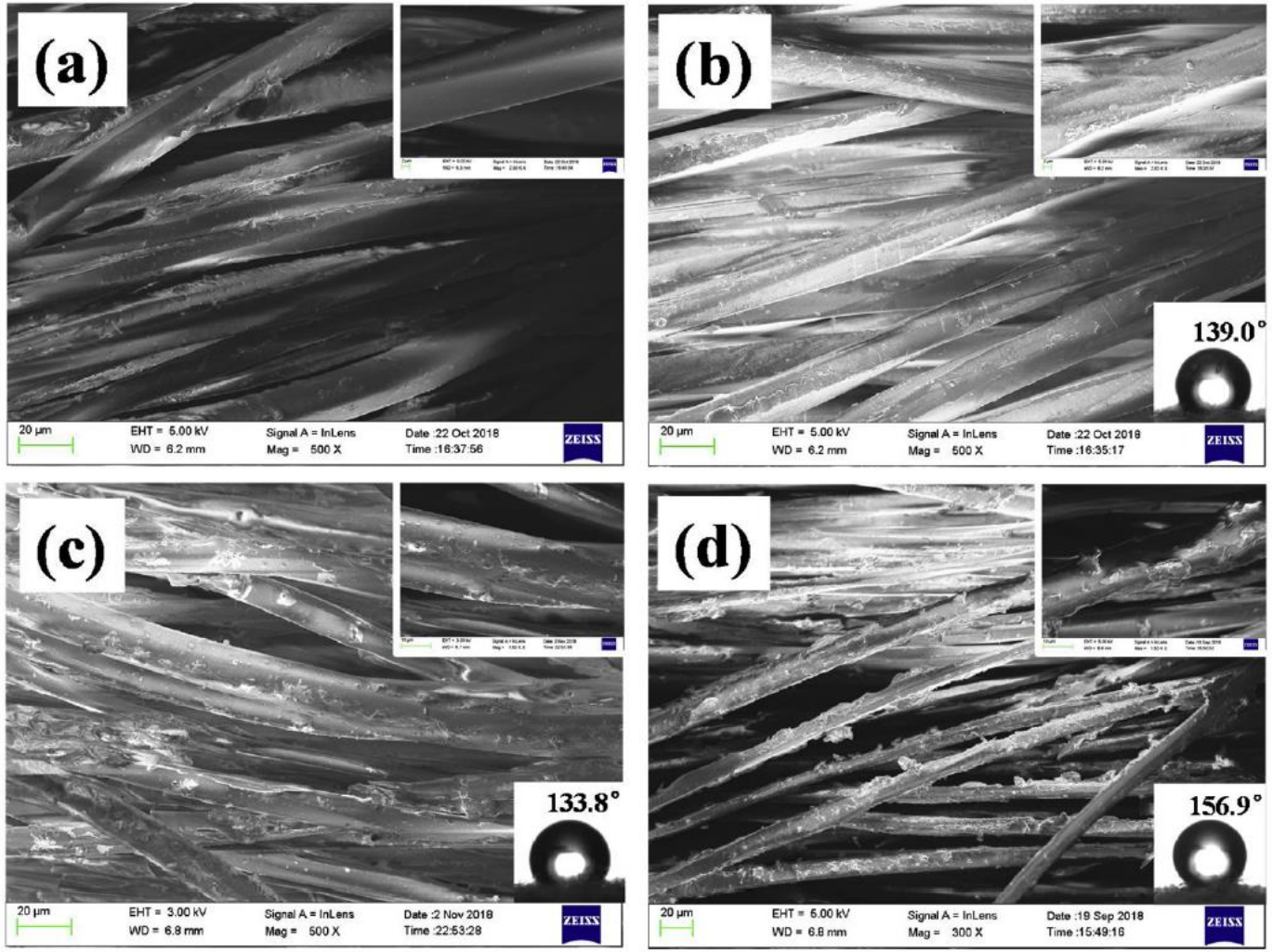
Slika 5. PDMS/SiO2/WS2 spužva koja separira a) vodu i *n*-heksan, odnosno b) vodu i kloroform.



[5] Zhai G., Qi L., He W., Dai J., Xu Y., Zheng Y., Huang J., Sun D. Durable super-hydrophobic PDMS@SiO2@WS2 sponge for efficient oil/water separation in complex marine environment. Environ. Pollut. 2021, 161, 493-502.

VOSKOVI KAO ADITIVI

- Poboljšanje hidrofobnosti, ali i termičkih i optičkih svojstava
- Superhidrofobni premazi (lakše održavanje) za npr. medicinske kute
- Zhao i suradnici : PDMS/parafinsko ulje kao dodatak poliesterskom vlaknu



Slika 6. Slike dobivene elektronskim mikroskopom (x500)

a) netretirano poliestersko vlakno
b) Poliestersko vlakno/parafinski vosak

c) Poliestersko vlakno/PDMS

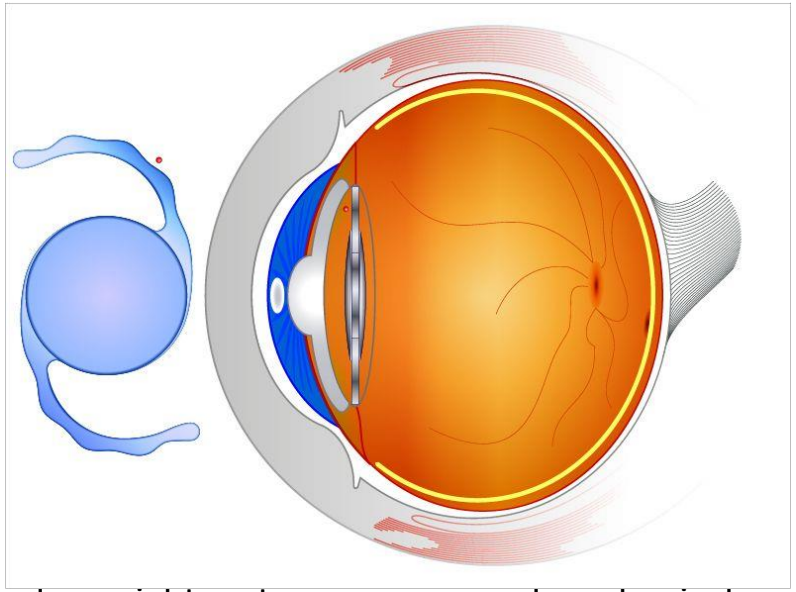
d)Poliestersko vlakno/PDMS/parafinski vosak

[6] Zhao Y., Liu E., Fan J., Chen B., Hu X., He Y., He C. Superhydrophobic PDMS/wax coated polyester textiles with self-healing ability via inlaying method. Prog. Org. Coat. 2019, 132, 100-107.

DRUGI POLIMERI KAO ADITIVI

- Često elastomer/plastomer: membrane za separaciju plinova, ali i uklanjanje hlapljivih organskih spojeva iz otpadnih voda

- Riehle i suradnici: Polisiloksan-urea-elastomeri kao intraokularne leće
- Mehanička, optička i *in vitro* citotoksičnost za PDMS različitih MM → u tijeku istraživanja na štakorima



[7] Riehle N., Thude S., Götz T., Kandelbauer A., Thanos S. Tovar G.E., Lorenz G. Influence of PDMS molecular weight on transparency and mechanical properties of soft polysiloxane-urea-elastomers for intraocular lens application. Eur. Polym. J. 2018, 101, 190-201.
[8] https://www.thenewyorkeyedoctor.com/post/what-are-intraocular-lenses-made-of-.html

REFERENCE

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[6] Zhao Y., Liu E., Fan J., Chen B., Hu X., He Y., He C. Superhydrophobic PDMS/wax coated polyester textiles with self-healing ability via inlaying method. Prog. Org. Coat. 2019, 132, 100-107.
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