



HRVATSKI ZAVOD ZA JAVNO ZDRAVSTVO

SLUŽBA ZA MEDICINU RADA

Nanomaterijali: poznato o nepoznatom

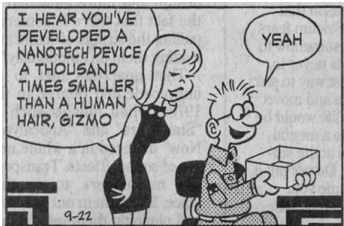
dr. sc. Sonja Damjanović Dešić, dipl. ing. kemije



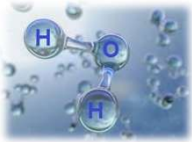
NANO

PREFIKS	tera	giga	mega	kilo	m	deci	centi	milli	mikro	nano	piko
SIMBOL	T	G	M	k		d	c	m	μ	n	p
BROJ	10^{12}	10^9	10^6	10^3	10^0	10^{-1}	10^{-2}	10^{-3}	10^{-6}	10^{-9}	10^{-12}

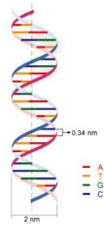
NANOMETAR → MILIJARDU PUTA **MANJE** OD METRA



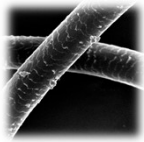

NANO SKALA



1,5 nm



2 nm



80 000 nm

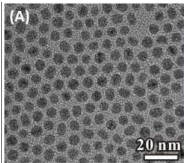


[nm/s]



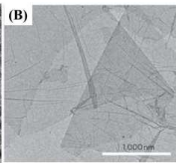
NANOMATERIJAL

prirodni, slučajni ili proizvedeni materijal koji sadrži čestice u nevezanom stanju ili kao skupine ili kao aglomerat i gdje je 50% ili više čestica čije je bar jedna dimenzija (npr. dužina, visina, širina i/ili promjer) u rasponu veličina od 1 do 100 nm.



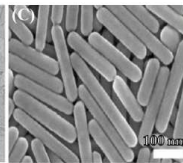
(A)

20 nm



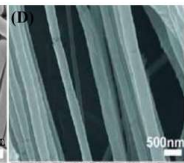
(B)

1000 nm



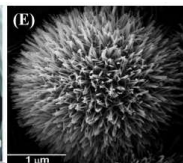
(C)

100 nm



(D)

500 nm



(E)

1 μm



KLASIFIKACIJA PREMA PORIJEKLU

NENAMJERNO NASTALI







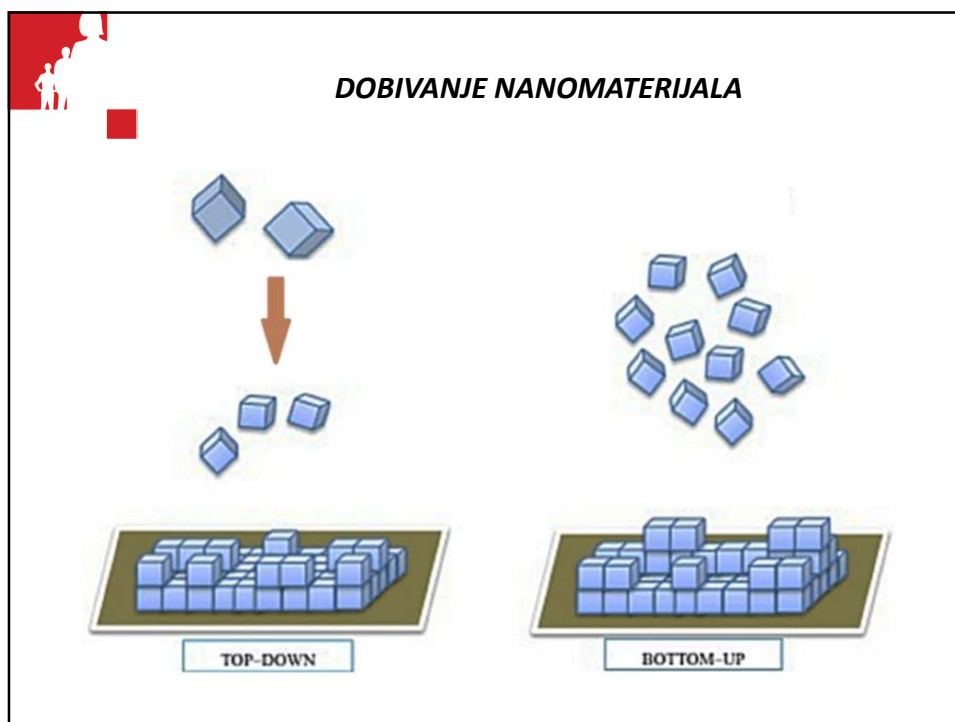
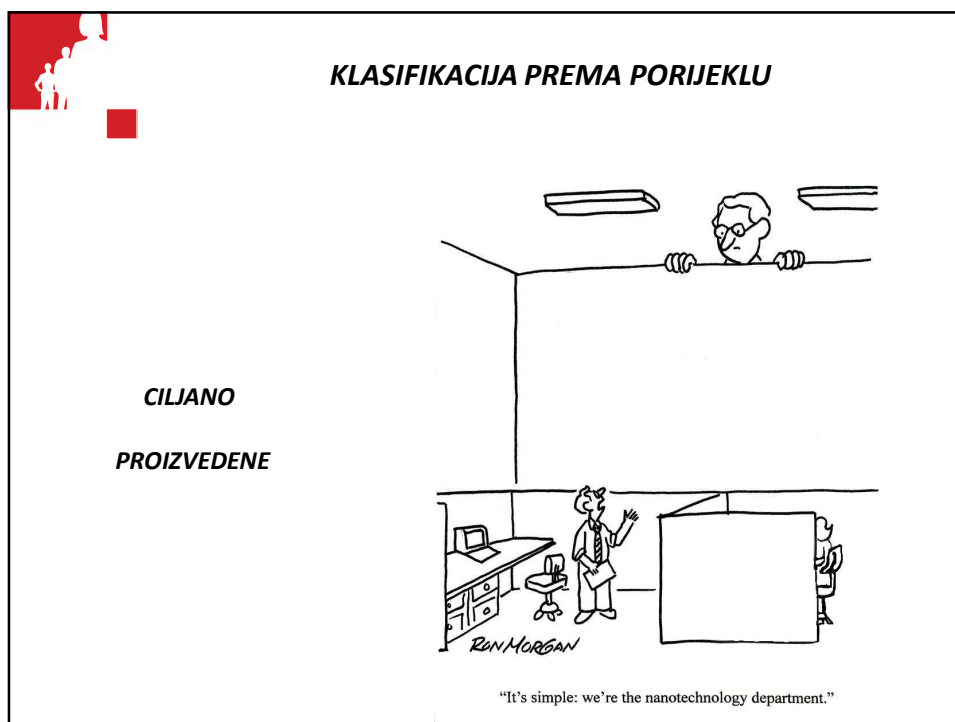
KLASIFIKACIJA PREMA PORIJEKLU

ANTROPOGENI







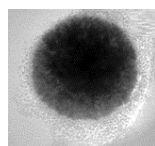
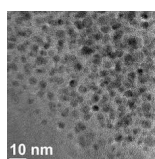


NANO U PROIZVODIMA

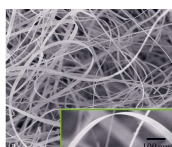
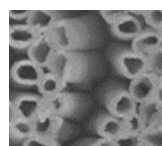


KLASIFIKACIJA PREMA BROJU DIMENZIJA MANJIH OD 100 nm

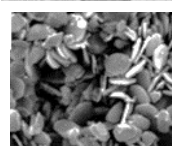
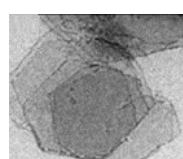
0 D



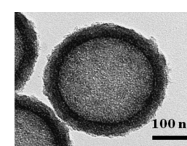
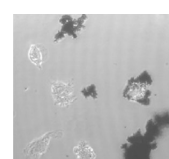
1 D

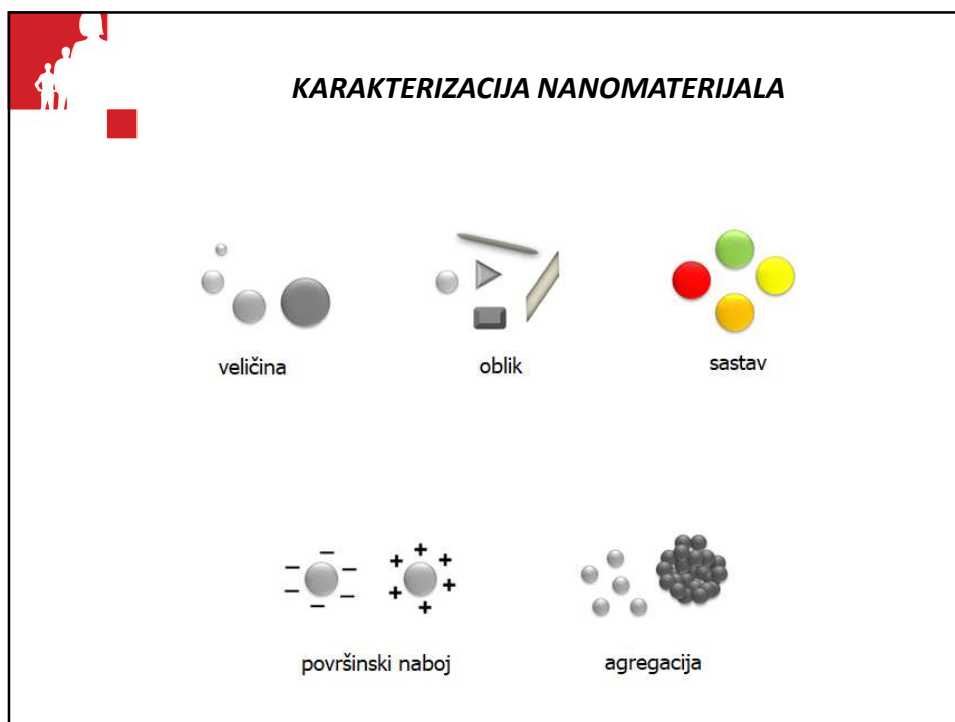


2 D

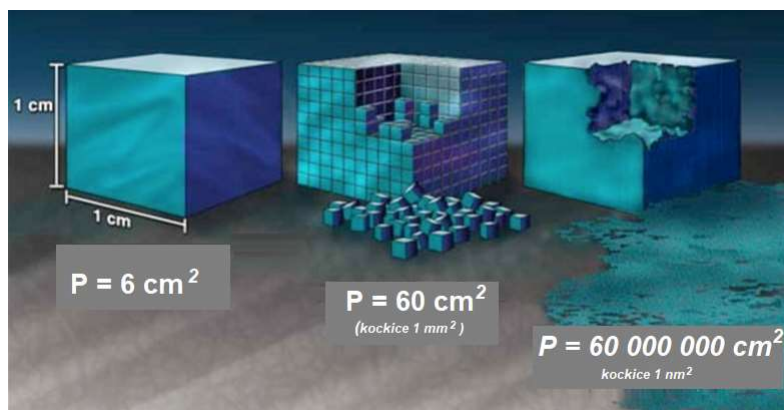


3 D

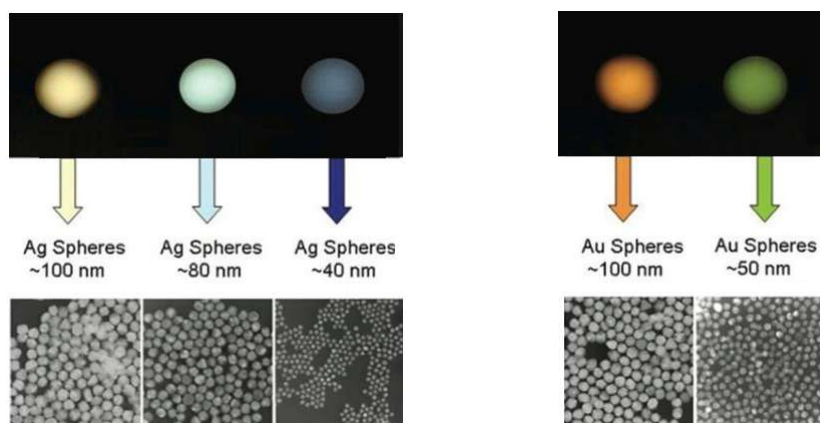




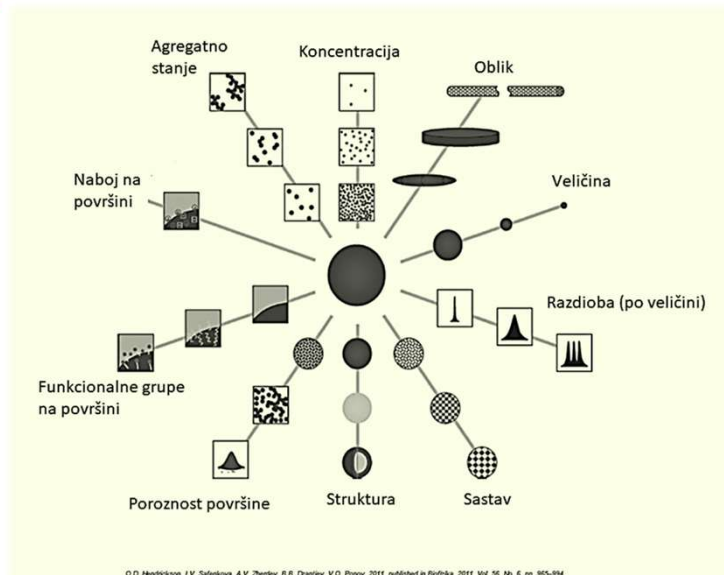
POVRŠINA NANOMATERIJALA



VELIČINA NANOČESTICA



METODE DOKAZIVANJA



MIKROSKOPSKE METODE



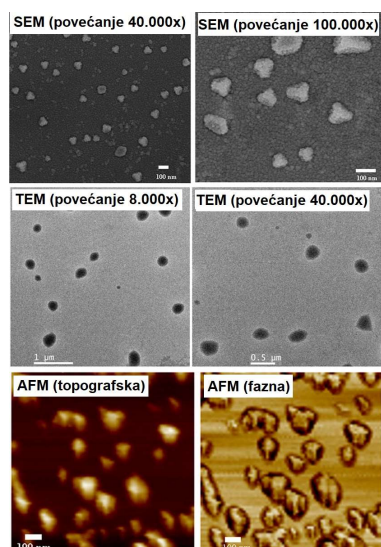
Skenirajuća elektronska mikroskopija



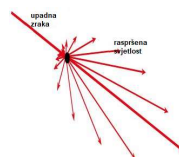
Transmisijaska elektronska mikroskopija



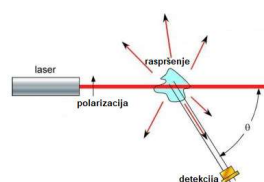
Mikroskopija atomskih sila



TEHNIKA RAZDVAJANJA PROTOČNIM POLJEM

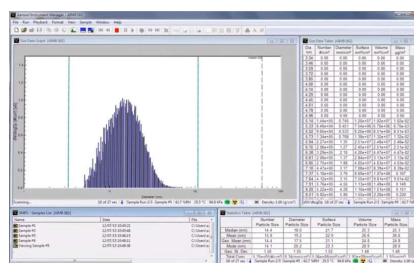


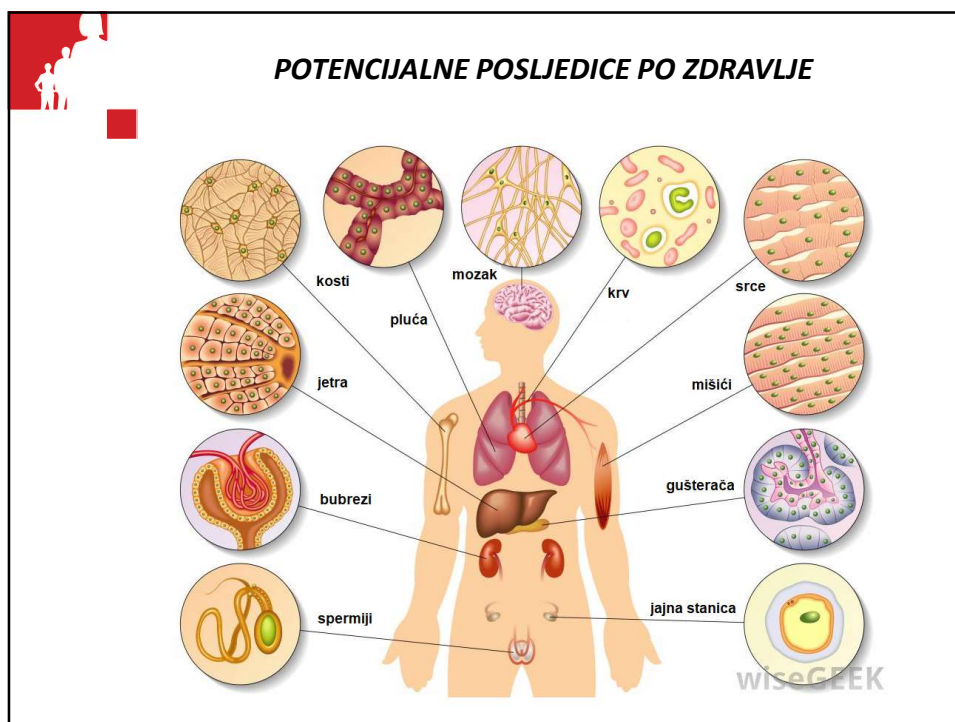
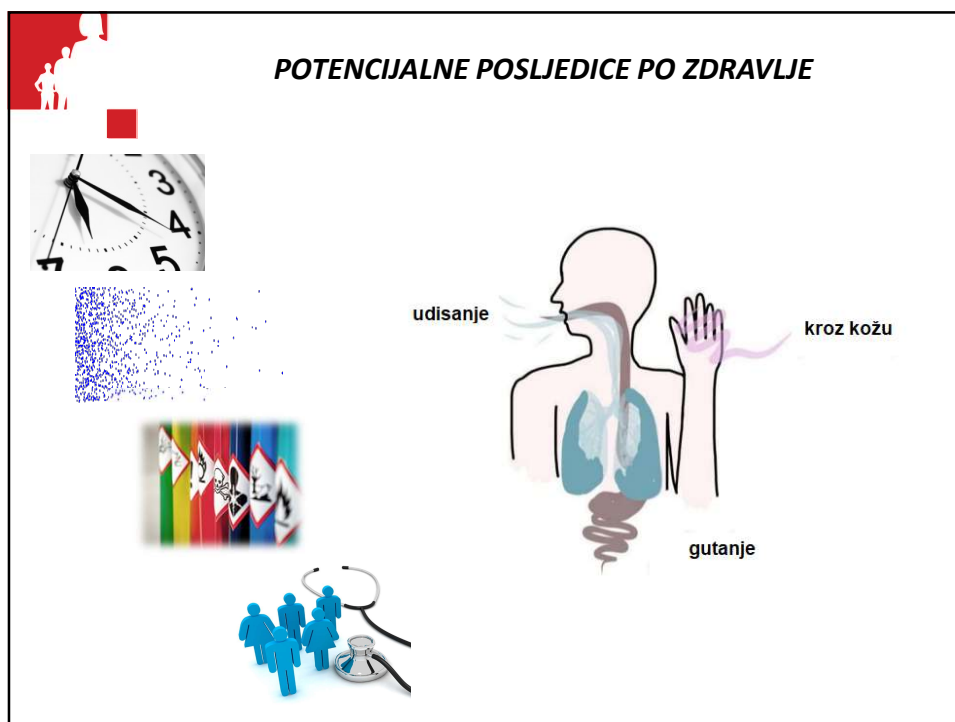
Detekcija višekutnim
svjetlosnim raspršenjem (MALS)



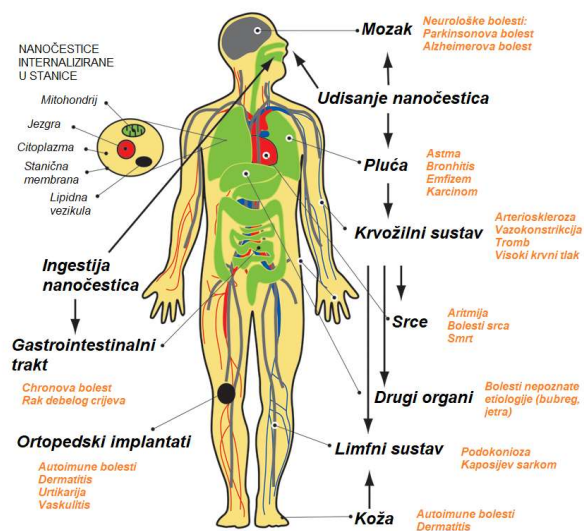
Detekcija dinamičkim
raspršivanjem svjetlosti (DLS)

SPEKTROMETAR ZA ODREĐIVANJE VELIČINE ČESTICA NA PRINCIPU NJIHOVE POKRETLJIVOSTI



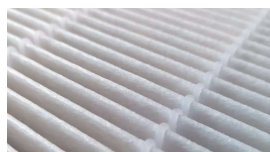


BOLESTI POVEZANE S IZLOŽENOSTI NANOMATERIJALIMA



C. Buzza, I. Pacheco, & K. Robbie, Nanomaterials and nanoparticles: Sources and toxicity, Biointerphases 2 (2007) MR17-MR21

MJERE ZAŠTITE



BUDUĆNOST



"The next big thing is ultra nano."



HRVATSKI ZAVOD ZA JAVNO ZDRAVSTVO

Služba za medicinu rada

Hrvatski zavod za javno zdravstvo

Radoslava Cimermana 64a, 10020 Zagreb