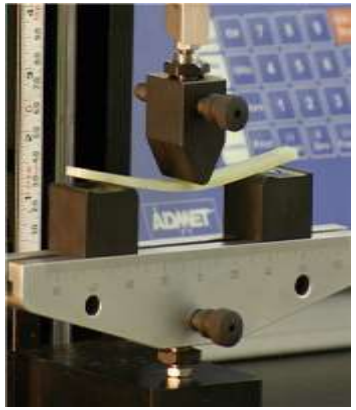
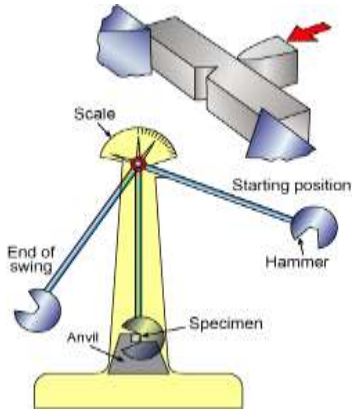
FASILITAS LABORATORIUM MATERIAL DI PRODI TEKNIK MESIN, UMY

PENGUJIAN MATERIAL

- BENDING
- FATIGUE
- IMPACT
- KEKERASAN
- METALOGRAFI
- KUAT TARIK





PENGEMBANGAN RISET MATERIAL

Perlakuan Permukaan

Komposit Serat Alam

Nanomaterial

PENGEMBANGAN RISET PERLAKUAN PERMUKAAN

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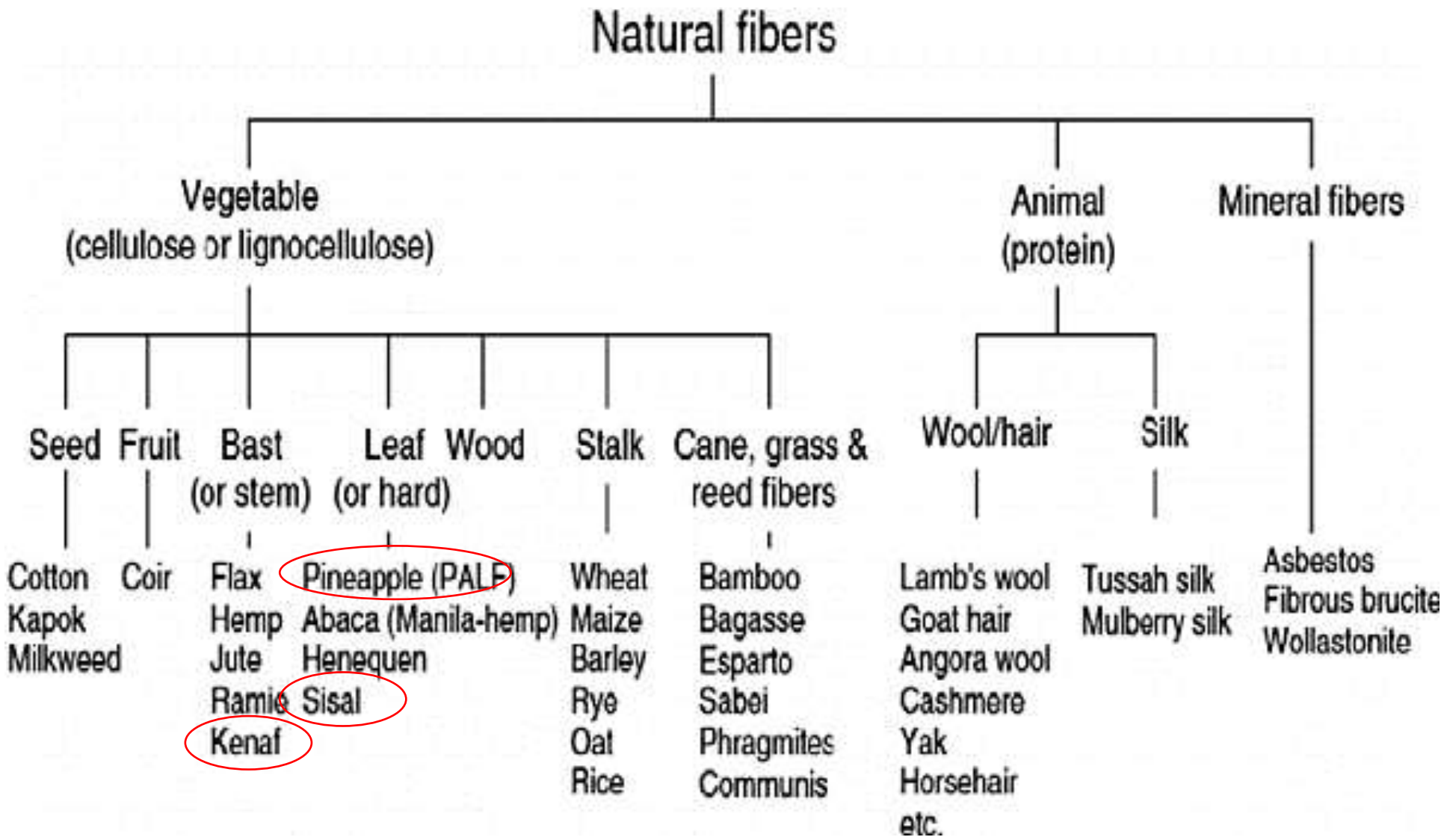
IMPLANTASI ION, ELECTROPLATING, POROUS MATERIAL, ANODIZING

PENGEMBANGAN RISET MATERIAL

Anodizing merupakan proses anodisasi adalah proses pembentukan lapisan oksida pada logam dengan cara bereaksikan atau mengkorosikan suatu logam terutama aluminium dengan oksigen (O2) yang diambil dari larutan elektrolit yang digunakan sebagai media, sehingga terbentuk lapisan oksida

PENGEMBANGAN RISET KOMPOSIT

KOMPOSIT SERAT ALAM


Natural fibers
Vegetable
(cellulose or lignocellulose)
Animal
(protein)
Mineral fibers
Seed
Fruit
Bast
(or stem)
Leaf
(or hard)
Wood
Stalk
Cane, grass &
reed fibers
Wool/hair
Silk
Cotton
Kapok
Milkweed
Coir
Flax
Hemp
Jute
Ramie
Kenaf
Pineapple (PALF)
Abaca (Manila-hemp)
Henequen
Sisal
Wheat
Maize
Barley
Rye
Oat
Rice
Bamboo
Bagasse
Esparto
Sabei
Phragmites
Communis
Lamb's wool
Goat hair
Angora wool
Cashmere
Yak
Horsehair
etc.
Tussah silk
Mulberry silk
Asbestos
Fibrous brucite
Wollastonite

Kenaf

Jute

Ijuk
Anak Gunung.com

Nanas

Pisang

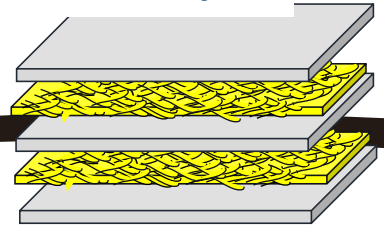
Sisal

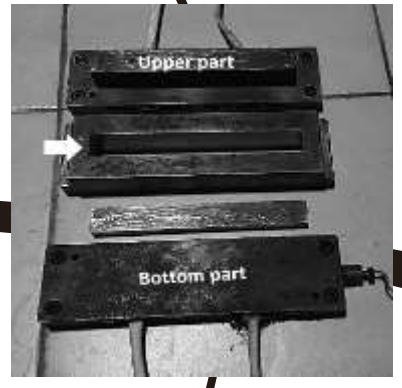
Example

Fabrication of the hybrid composites

Alkali treatment
(6% NaOH, 4 h)

Fiber/matrix: 30/70

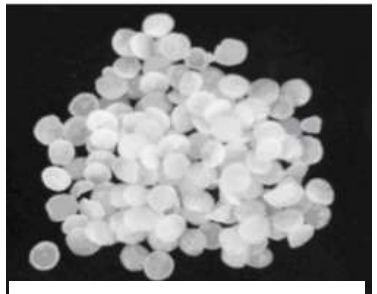




170°C, 15 min

Hybridization

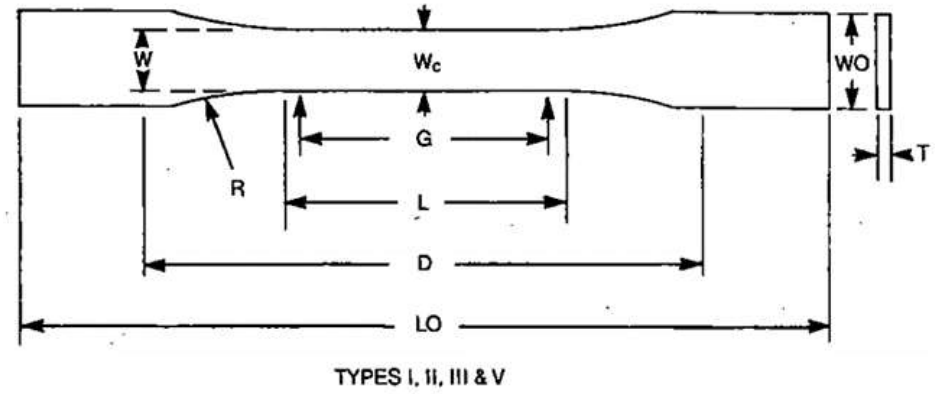
E-glass/sisal/PP
hybrid composites

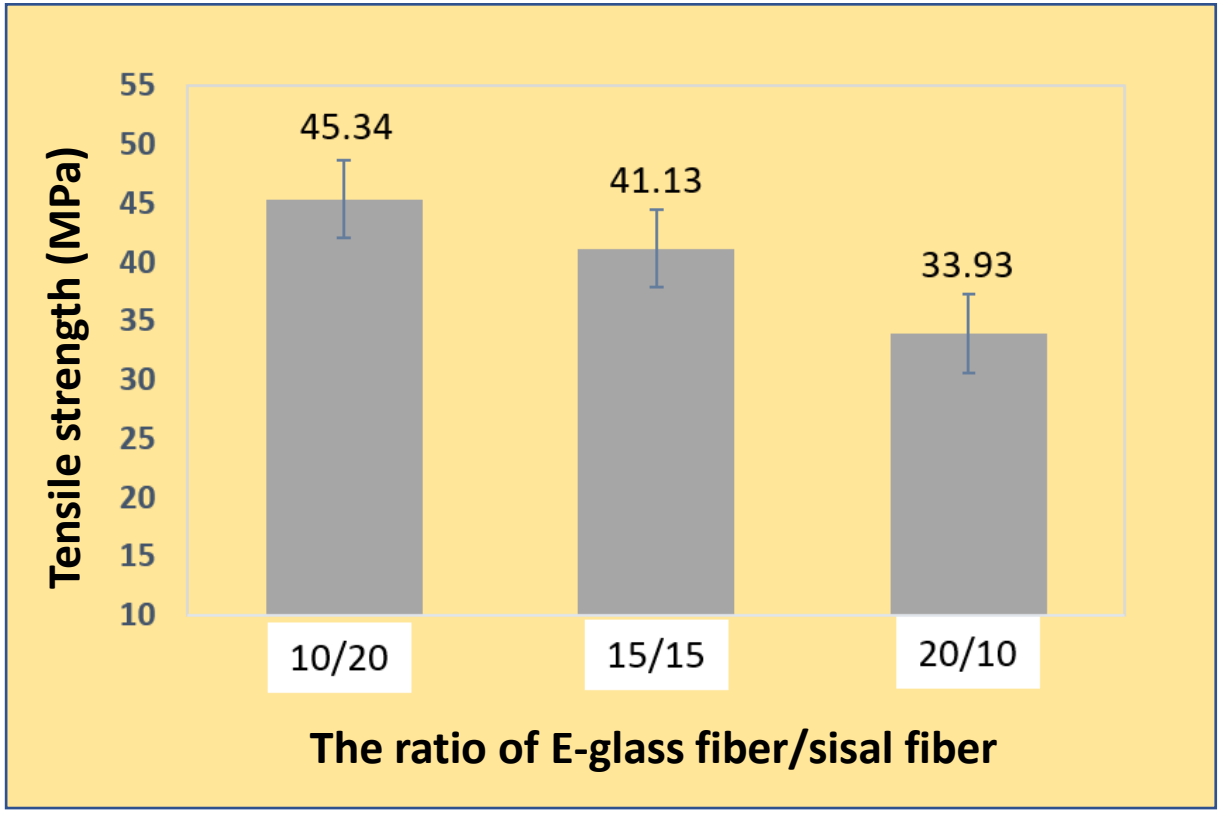


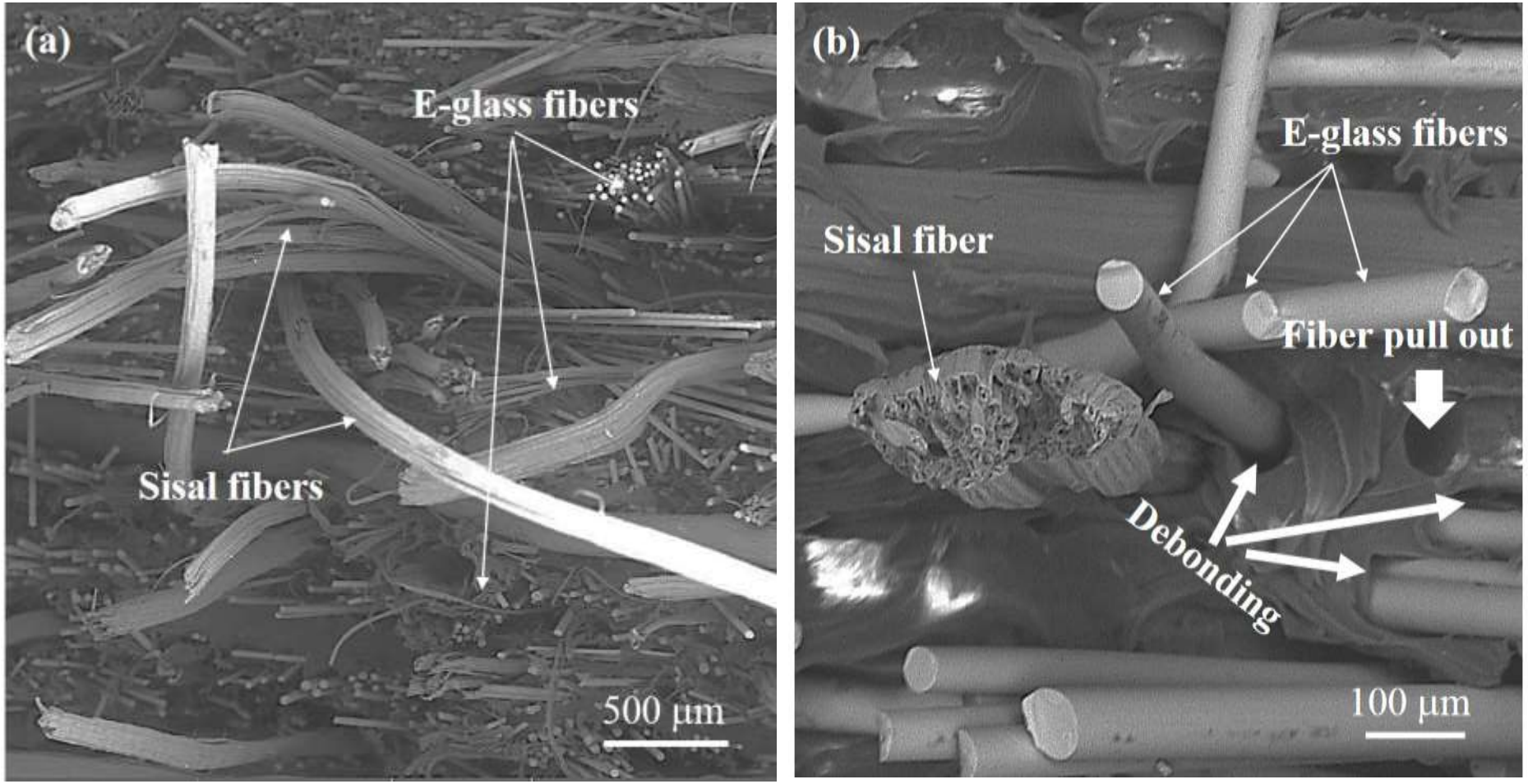
NaOH granulars

E-glass/sisal: 10/20, 15/15, 20/10

Tensile test







SEM micrographs of E-glass/sisal/PP hybrid composites

PENGEMBANGAN RISET NANOMATERIAL

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NANOFIBER TECHNOLOGY

WHAT IS NANOMATERIAL

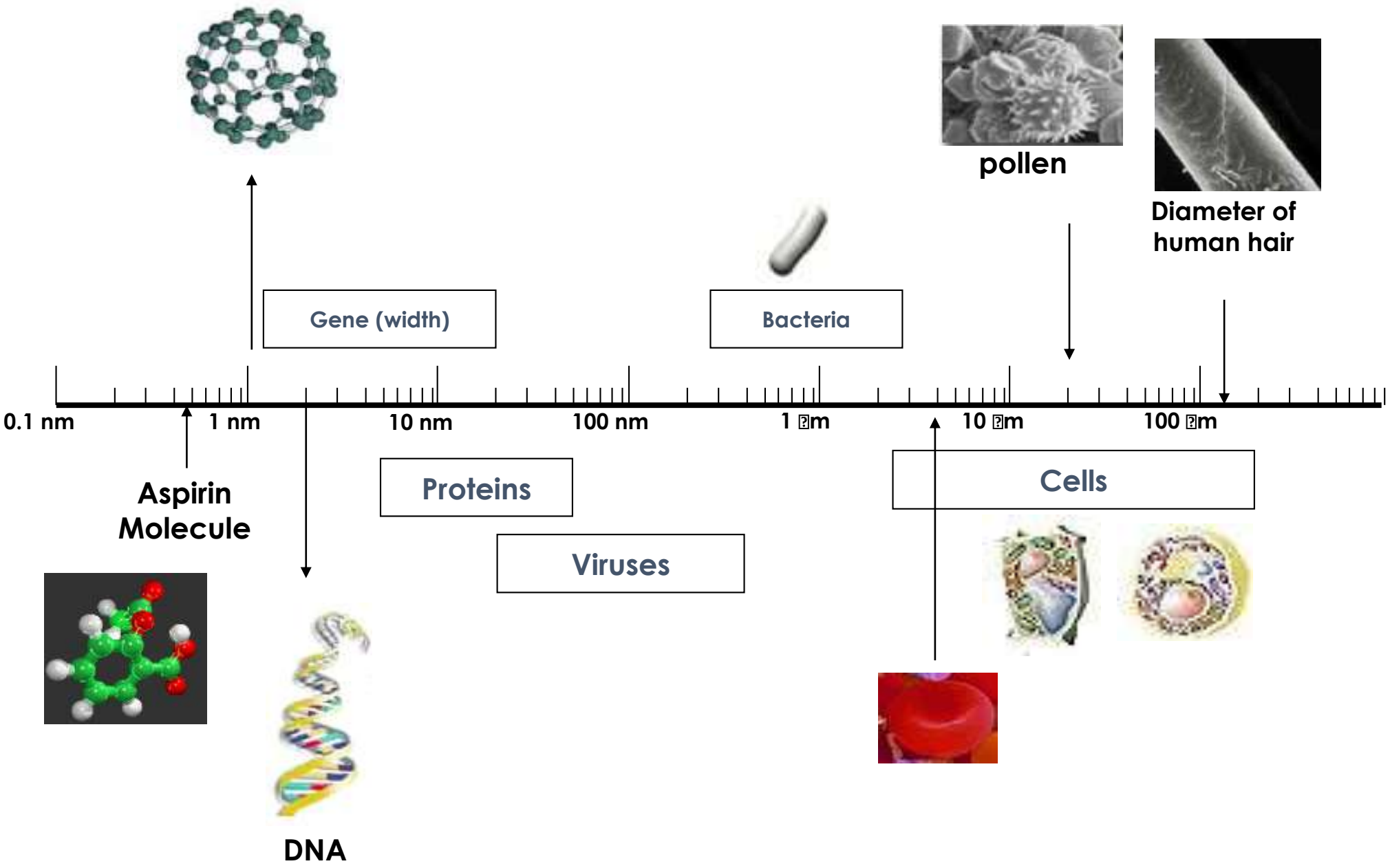
Partikel yang berukuran antara 0.1-100 nm dikatagorikan/ diklasifikasikan sebagai Nanomaterial

Ukuran rata-rata sebuah atom adalah r = 1-2 Angstrom (Å)

1 nm = 10 Å

1 nm = 10^{-9} m

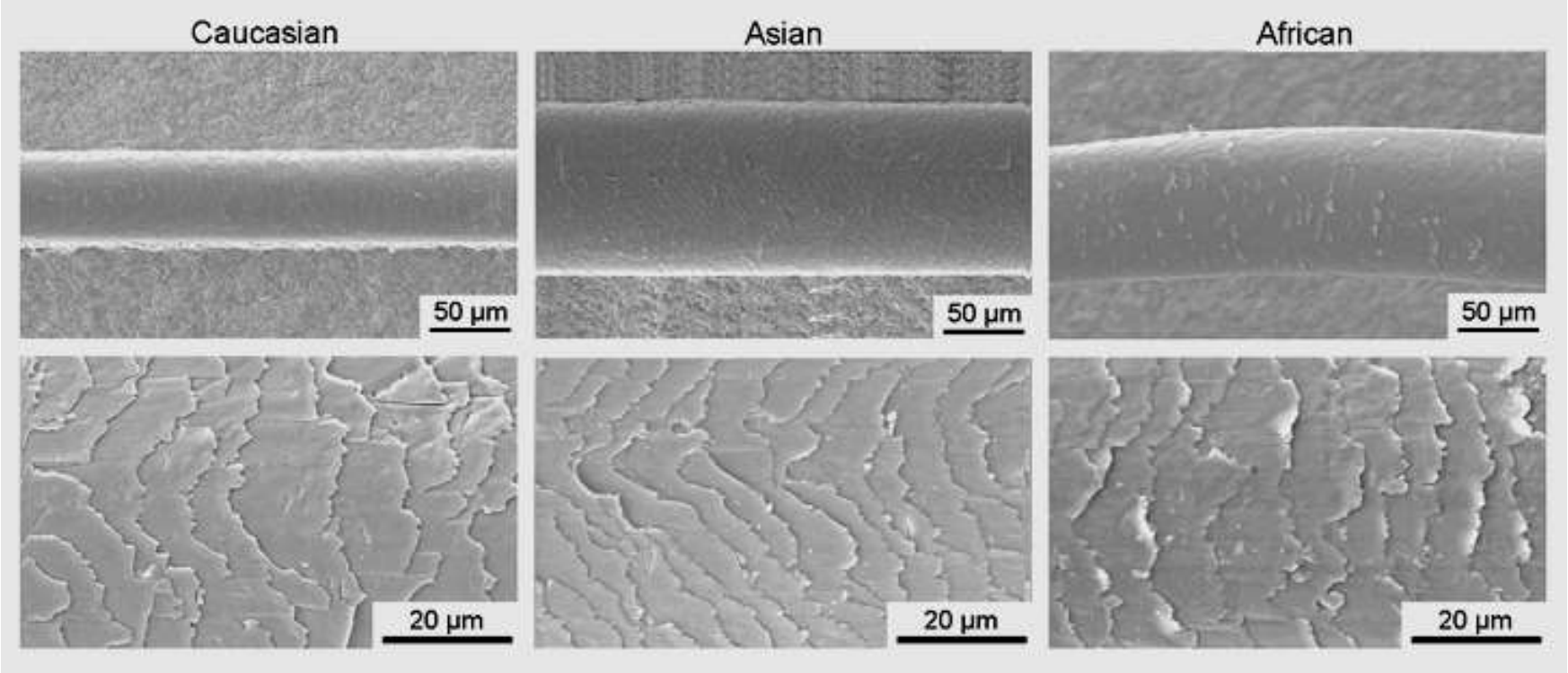
1 nm ~ 3-5 atom


pollen
Diameter of human hair
Gene (width)
Bacteria
0.1 nm
1 nm
10 nm
100 nm
1 m
10 m
100 m
Aspirin Molecule
Proteins
Cells
Viruses
DNA

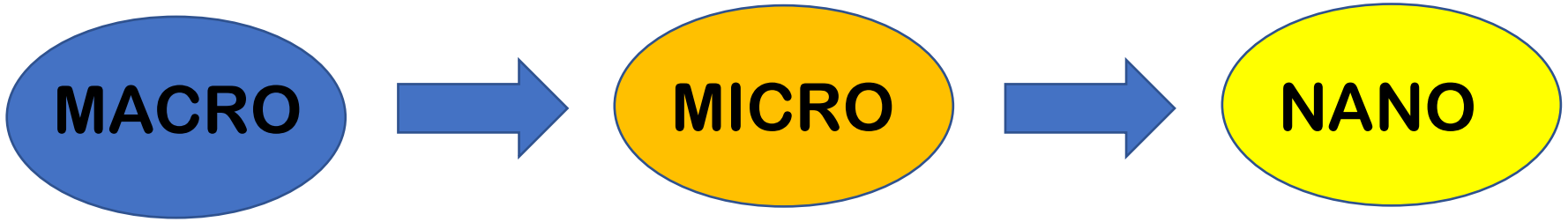
A SEM image of human hair

1 nanometer (nm) = 10^{-3} μm = 10^{-9} m

A human hair is about 80.000 nm in wide



Size effect



Going small to big advances

Bulk materials

(constant physical properties regardless its size)

Nanomaterials

(size dependent properties)

Improved various properties

Nanoscaled material

Macroscaled material

The surface area of a <u>spherical particle</u>:

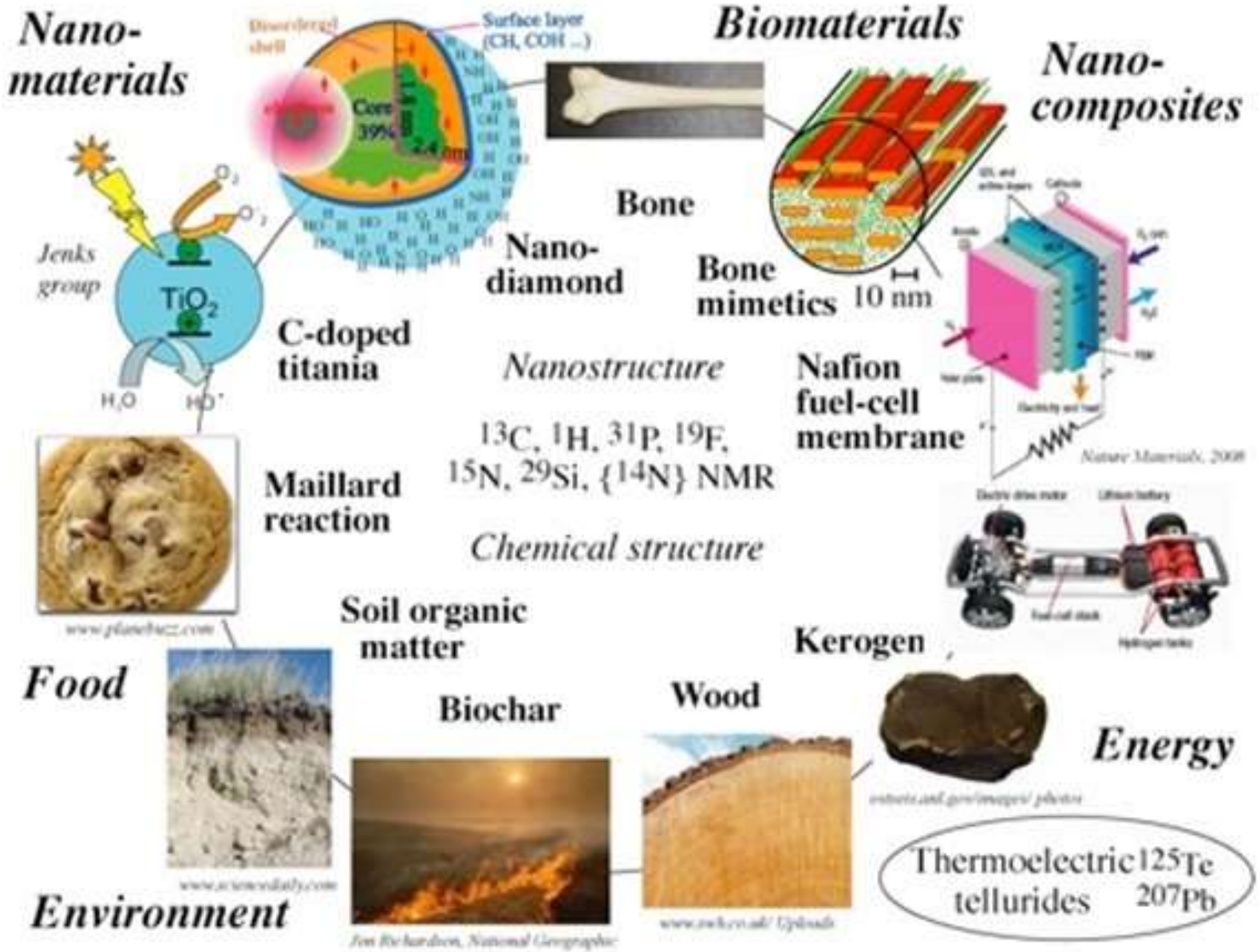
$SA = 4\pi r^2$

V (volume) $= 4/3\ \pi r^3$

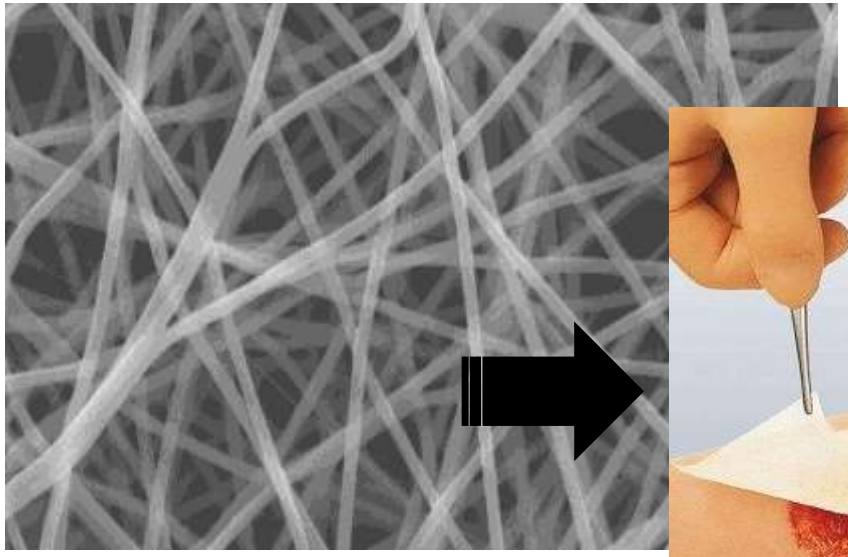
For macro-sized sphere with radius of 1 cm (0.01 m)

$SA = 1.3 \times 10^{-3}\ m^2$ SA/V= 300 1 nm = 10^{-9} m SA/V= 3.10^{10}

$V = 4.2 \times 10^{-6}\ m^3$


Nano-
materials
Surface layer
(CH, COH ...)
Core
39%
Biomaterials
Nano-
composites
Bone
Nano-
diamond
Bone
mimetics
10 nm
Jenks
group
TiO_2
C-doped
titania
Nanostructure
Nafion
fuel-cell
membrane
^{13}C, ^{1}H, ^{31}P, ^{19}F,
^{15}N, ^{29}Si, {^{14}N} NMR
Maillard
reaction
Chemical structure
Soil organic
matter
Kerogen
Food
Biochar
Wood
Energy
Thermoelectric ^{125}Te
tellurides ^{207}Pb
Environment

Pengembangan Riset Material



ELEKTRONIK

Aloe Vera

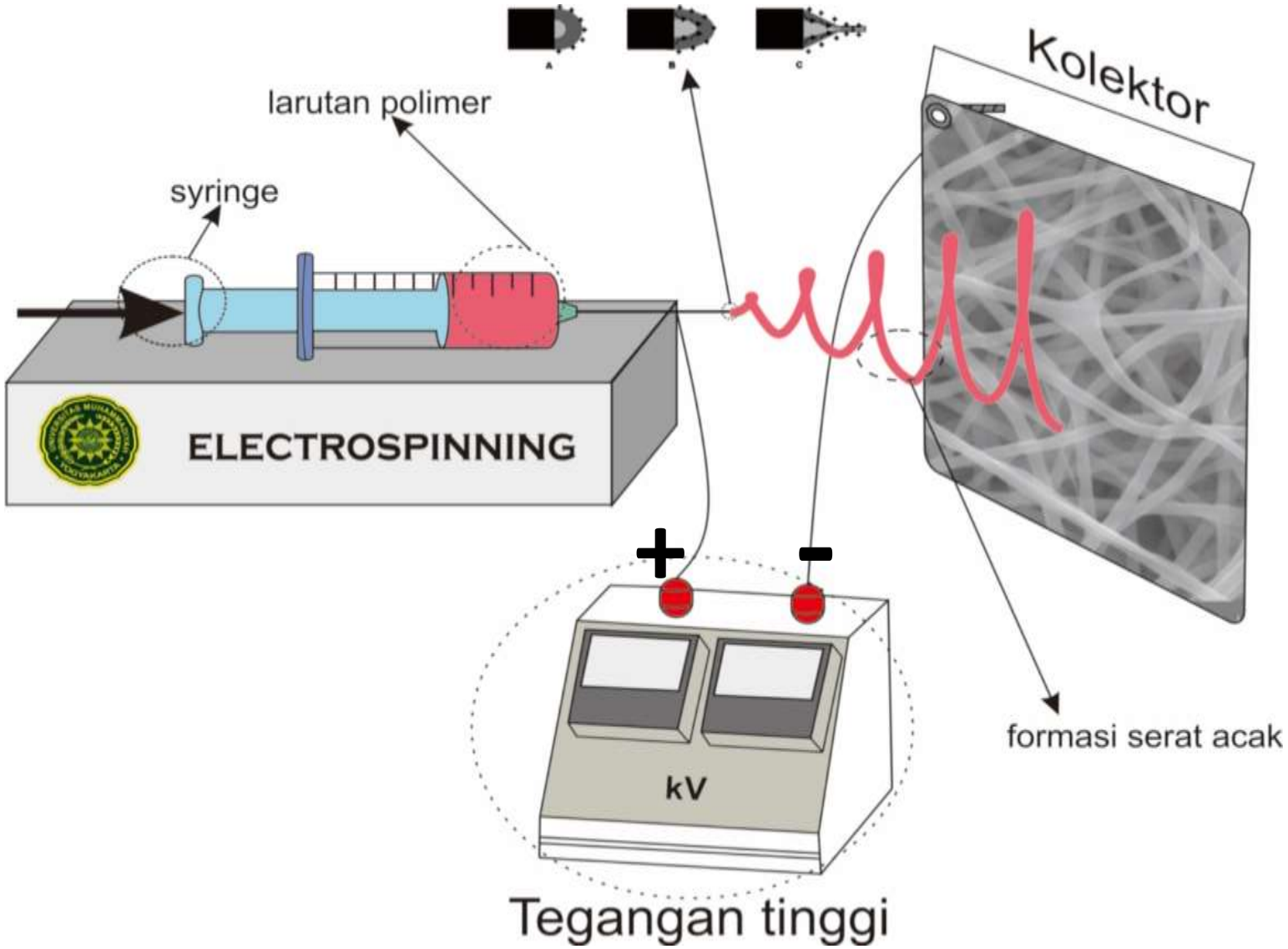
Lendir bekicot

PVA

Kitosan

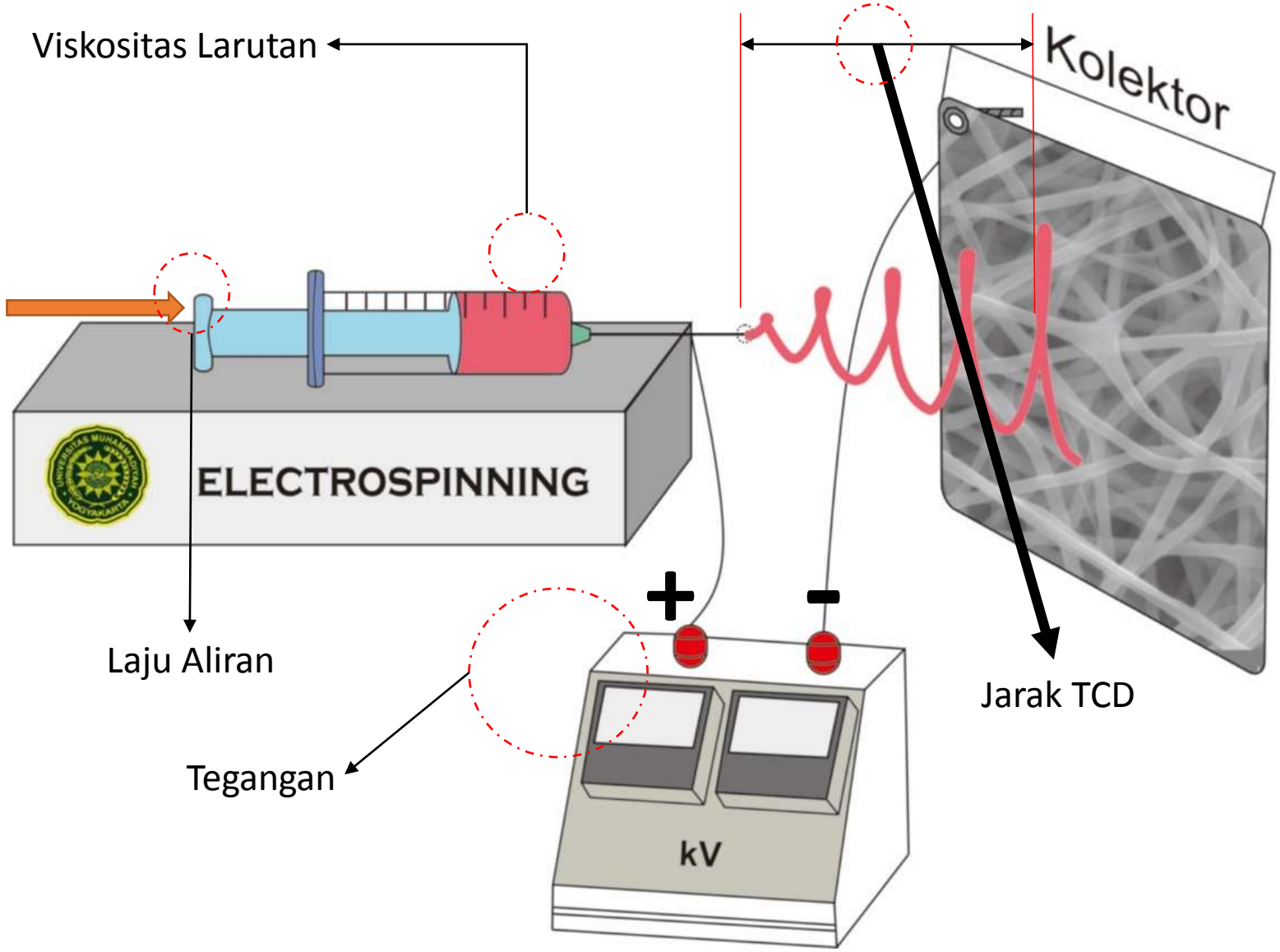
Pengembangan Riset Material

ELECTROSPINNING

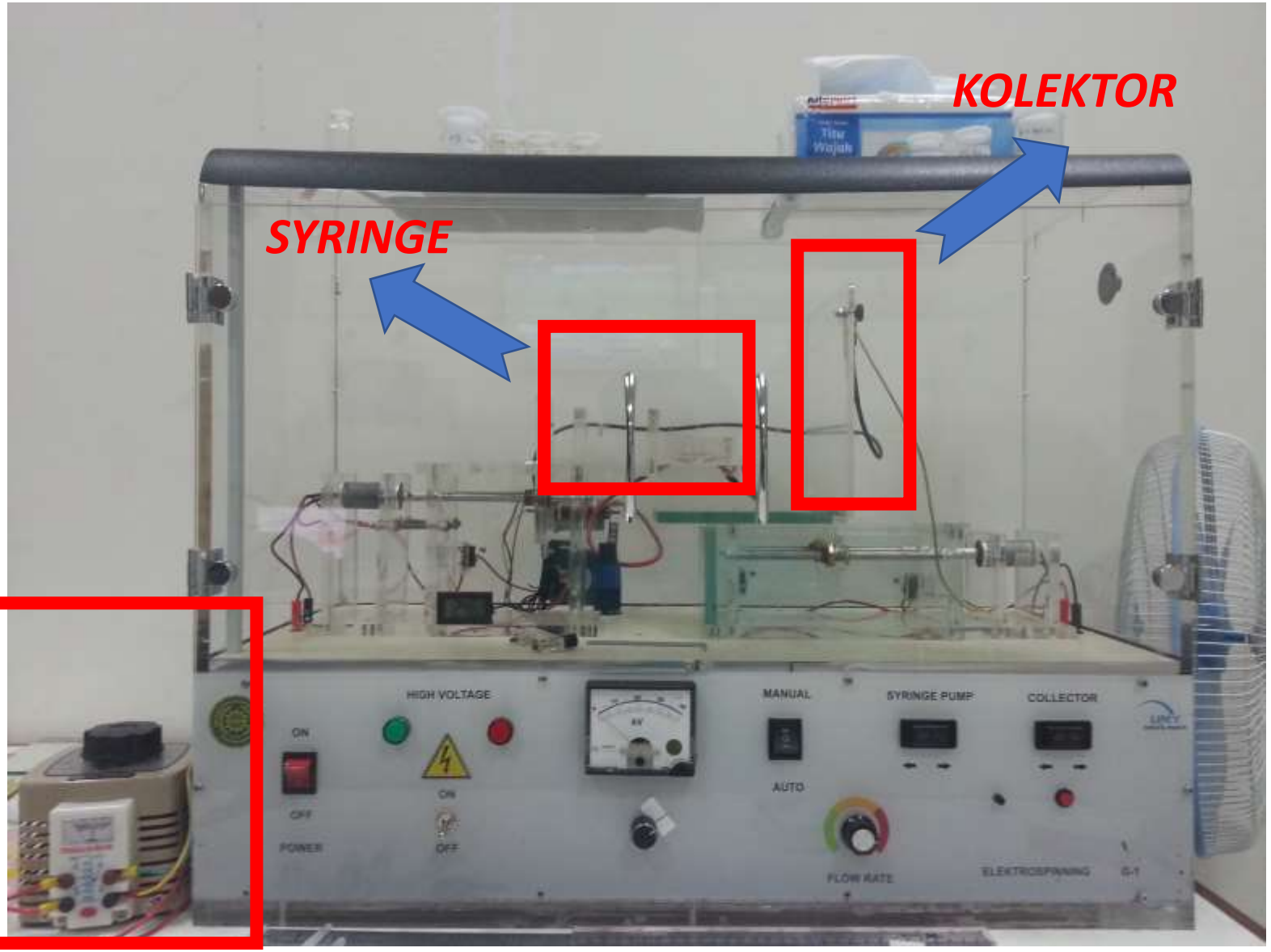


Pengembangan Riset Material

ELECTROSPINNING

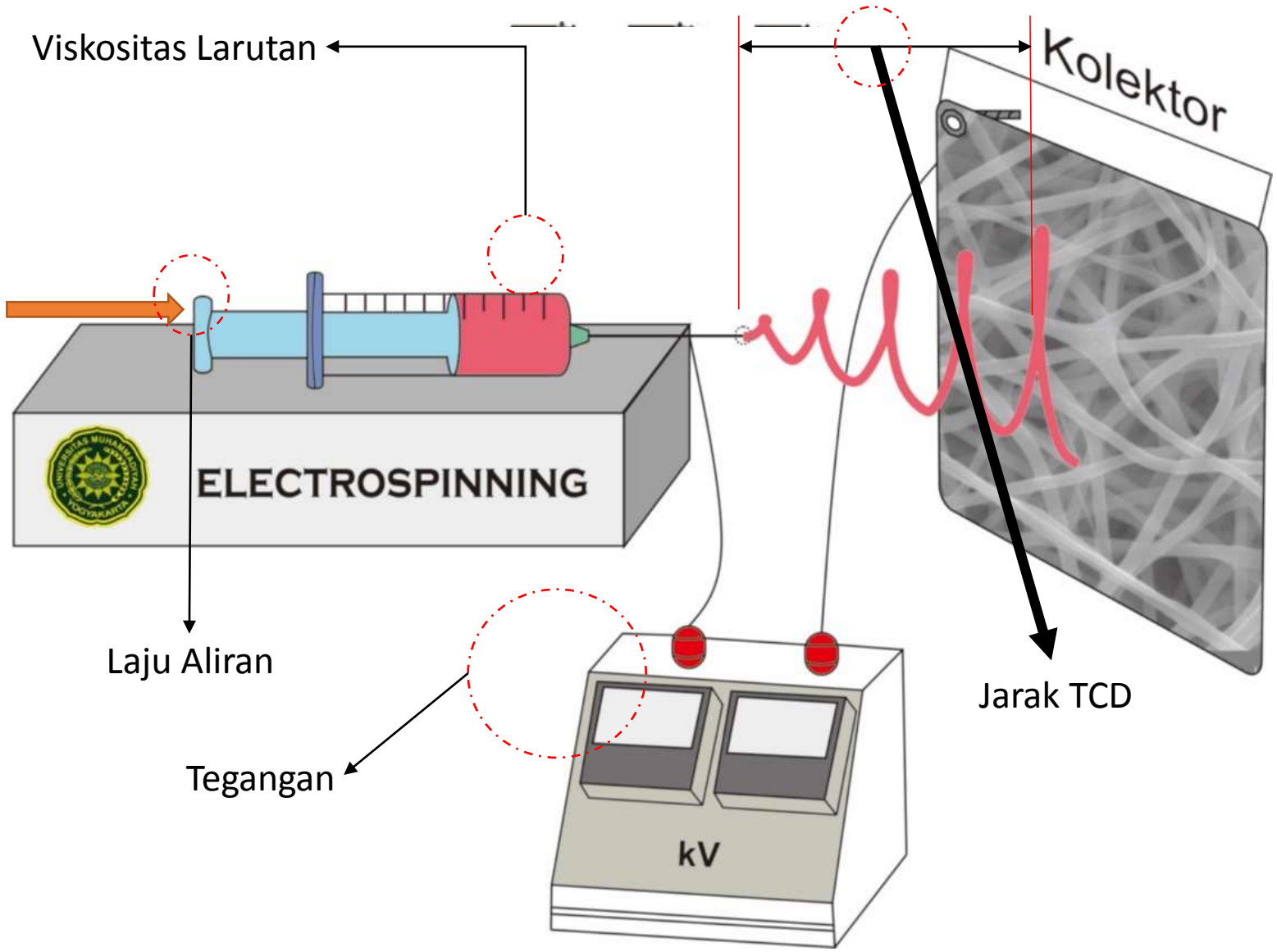


Pengembangan Riset Material

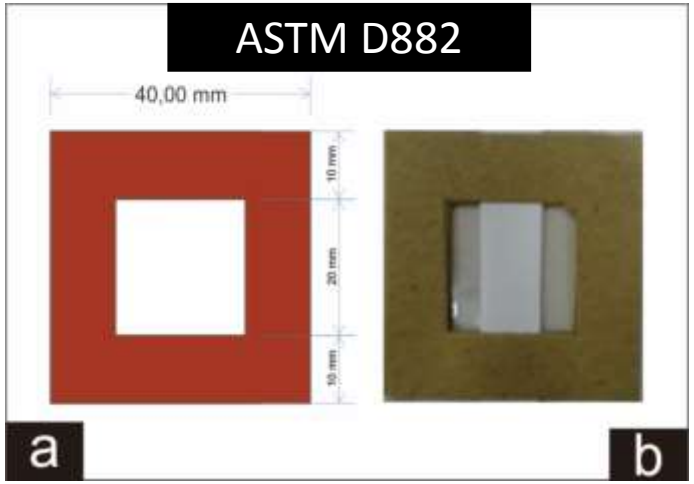


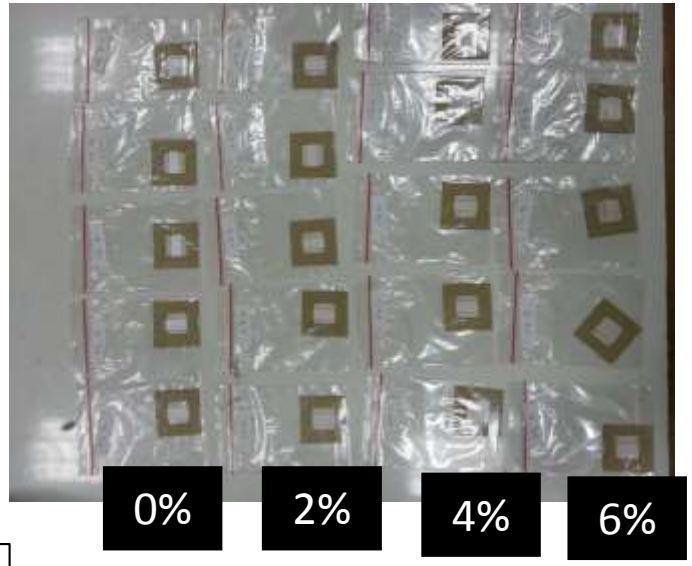
Pengembangan Riset Material

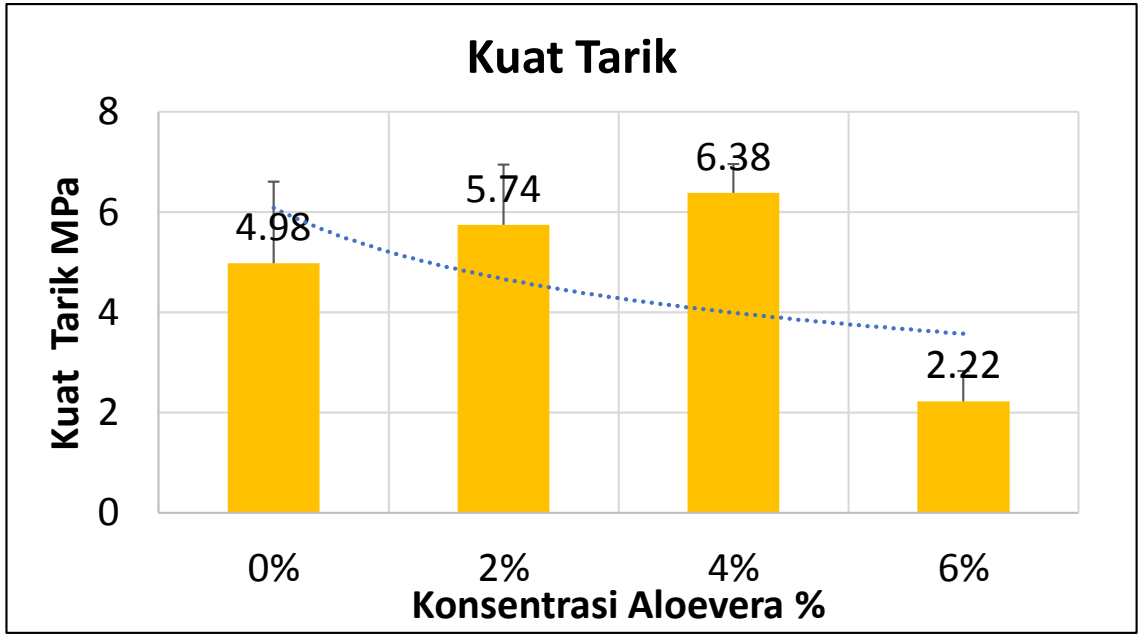
ELECTROSPINNING



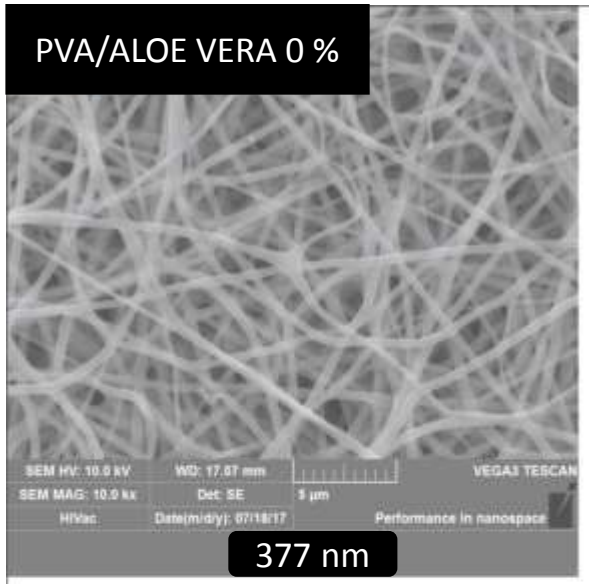
PENGUJIAN KUAT TARIK

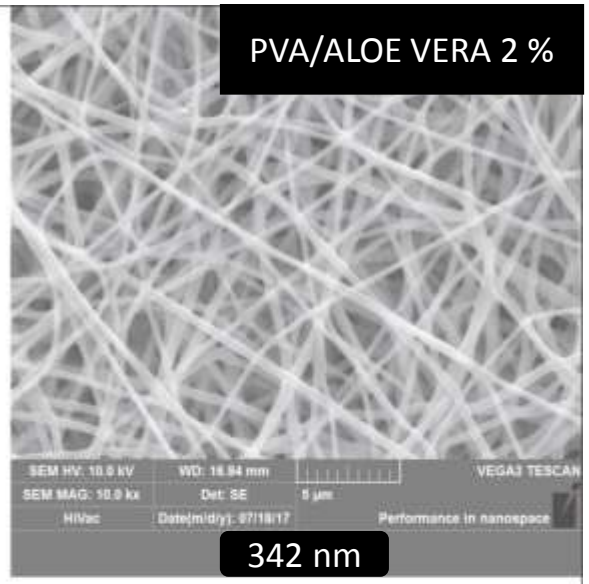


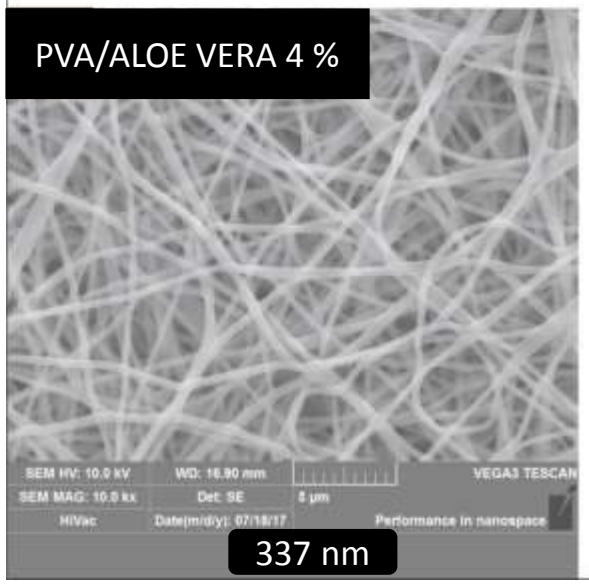


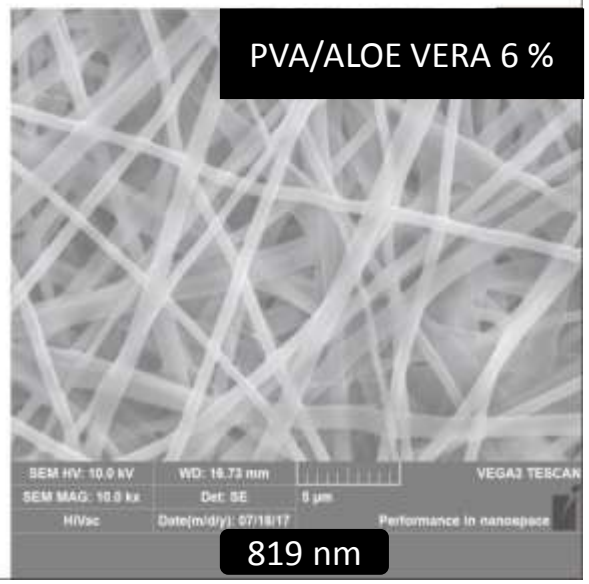


HASIL PENGUJIAN SEM









SELESAI