Nanometrología:

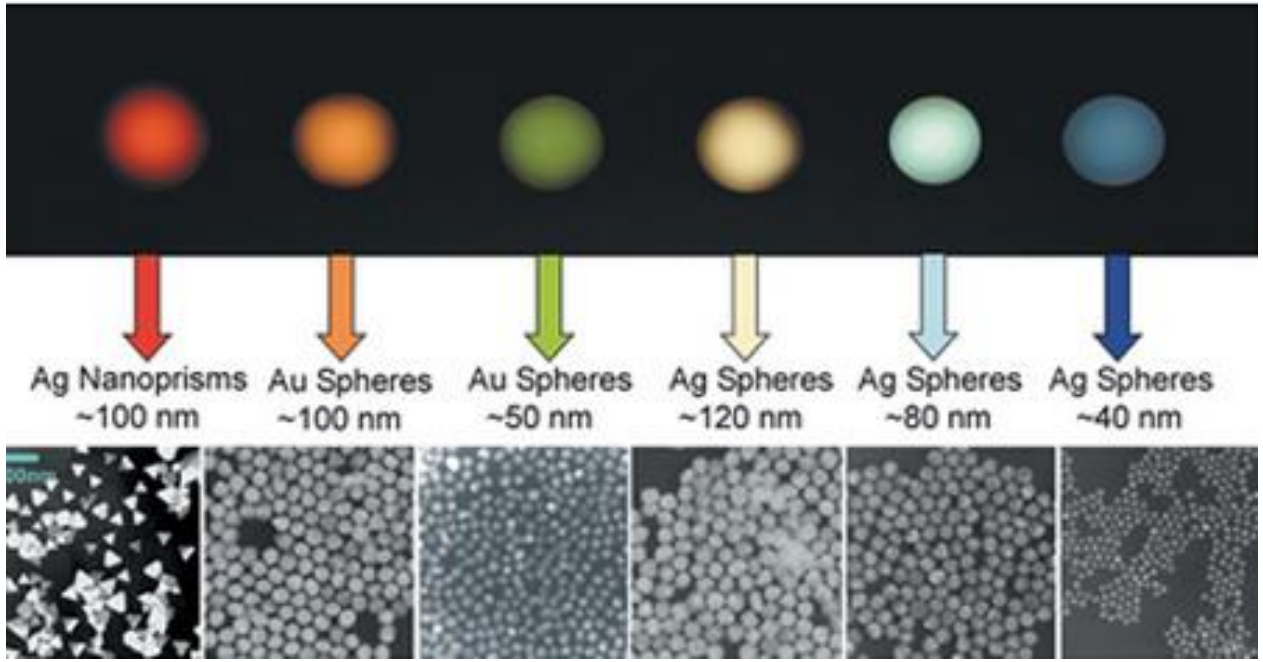
Próximo desafío para el MERCOSUR

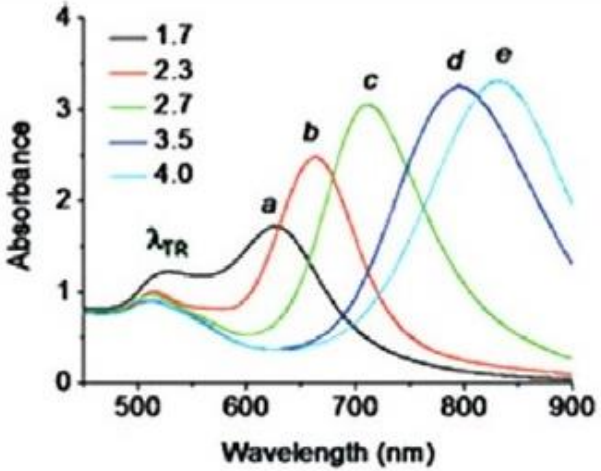
DR. EDUARDO MÉNDEZ

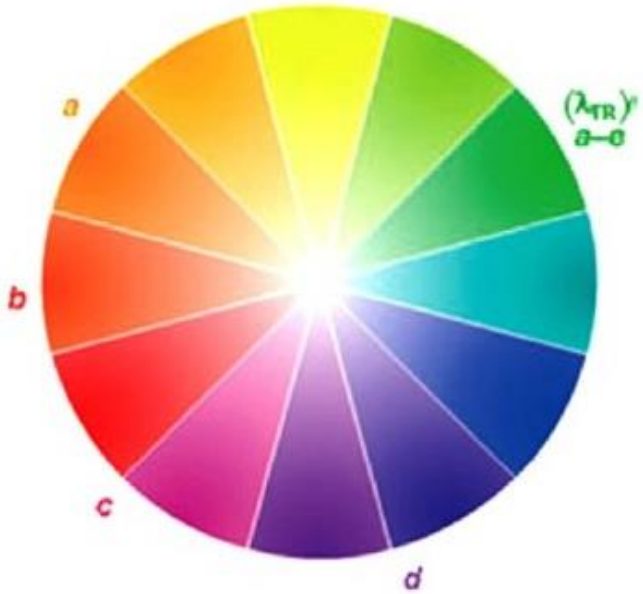
LABORATORIO DE BIOMATERIALES, INSTITUTO DE QUÍMICA BIOLÓGICA

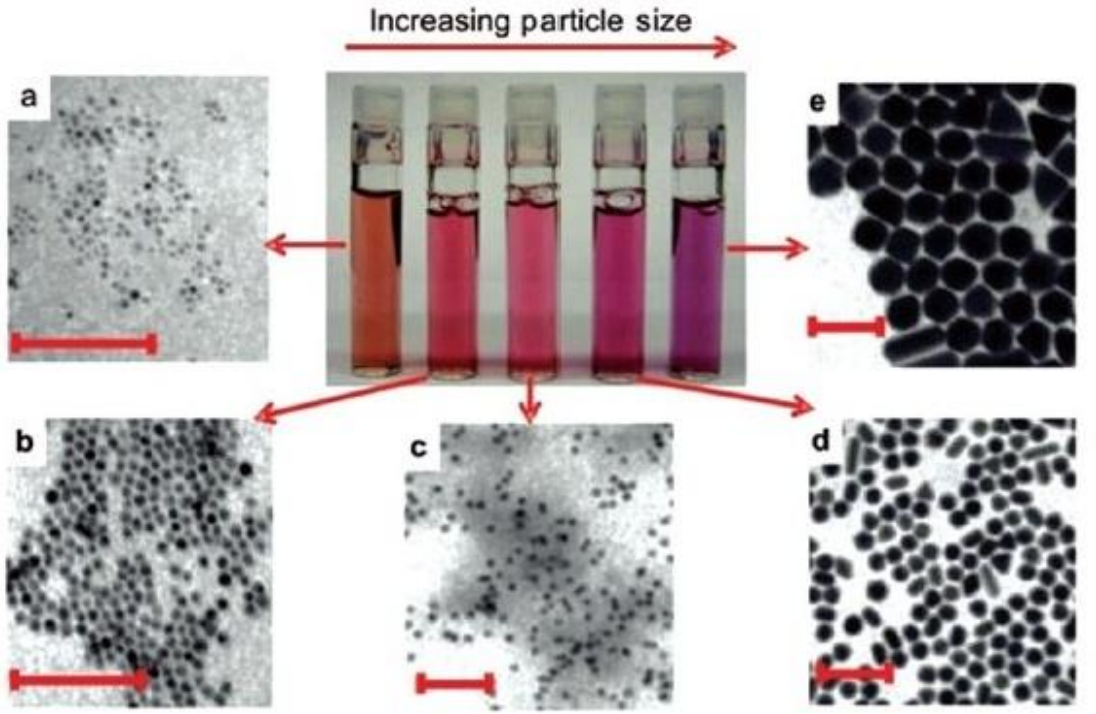
FACULTAD DE CIENCIAS, UNIVERSIDAD DE LA REPÚBLICA

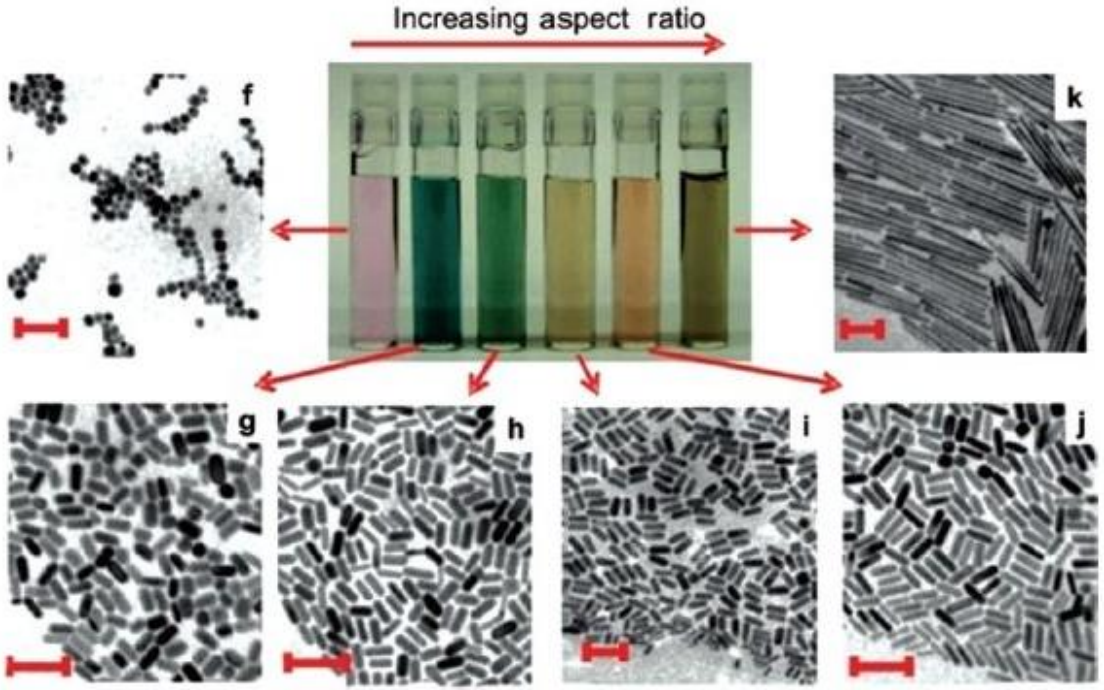
EMENDEZ@FCIEN.EDU.UY

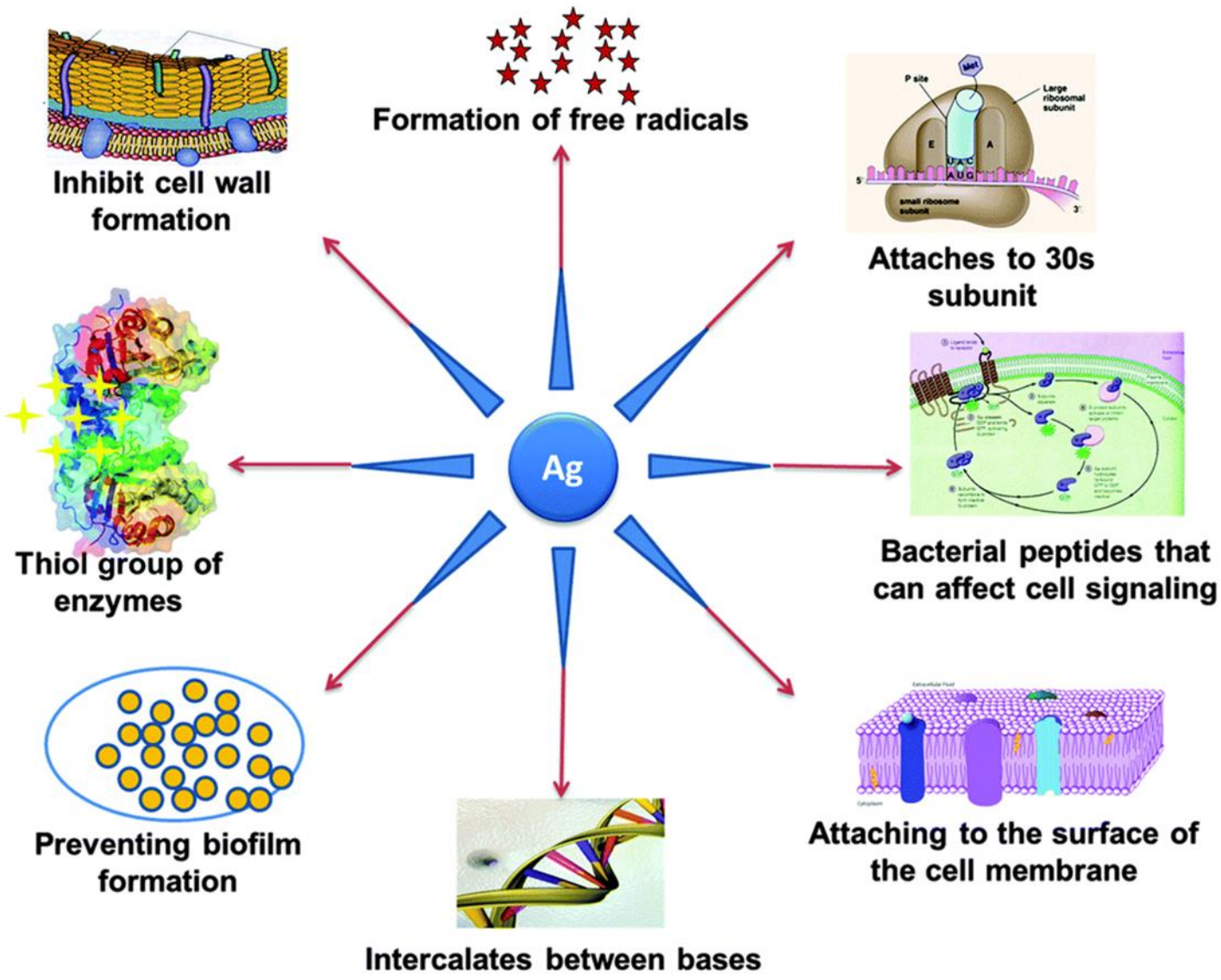

Ag Nanoprisms ~100 nm
Au Spheres ~100 nm
Au Spheres ~50 nm
Ag Spheres ~120 nm
Ag Spheres ~80 nm
Ag Spheres ~40 nm


1.7
2.3
2.7
3.5
4.0
Absorbance
Wavelength (nm)
λ_{TR}
a
b
c
d
e


a
b
c
d
$(\lambda_{TR})^{a-e}$


Increasing particle size
a
b
c
d
e


Increasing aspect ratio
f
g
h
i
j
k


Ag
Inhibit cell wall formation
Formation of free radicals
Attaches to 30s subunit
Thiol group of enzymes
Bacterial peptides that can affect cell signaling
Preventing biofilm formation
Attaching to the surface of the cell membrane
Intercalates between bases

ASSURED
SILVER BANDAGES
SILVER IN THE PAD

ECO-FABRIC SHORT SOCKS
NANOWAX
ECO-FABRIC KNEE GUARD
BEHR
NanoMask

CORSODYL
DAILY

ZYMOX
Brushless Enzymatic
ORAL CARE THERAPY
WATER ADDITIVE
BREATH FRESHENER
DENTAL GEL

Xylin
NANO SILVER
DENTAL FLOSS

Supplements

JILBERE NANO SILVER
JUMBO CONICAL TAPER CURLING IRON
nano
jumbo conical
100% AUTHENTIC WITH
VERIFIABLE SERIAL NUMBER

Silver Strip™
(Best in the world)
The Silverlon Adhesive Strip provides the safest and most powerful antimicrobial protection available today. Used by many hospitals, and tested superior to Johnson & Johnson antimicrobial Band Aids or Curad Silver adhesive strips.
SILVERLON

nanoCORE

¿Tienen nanopartículas?

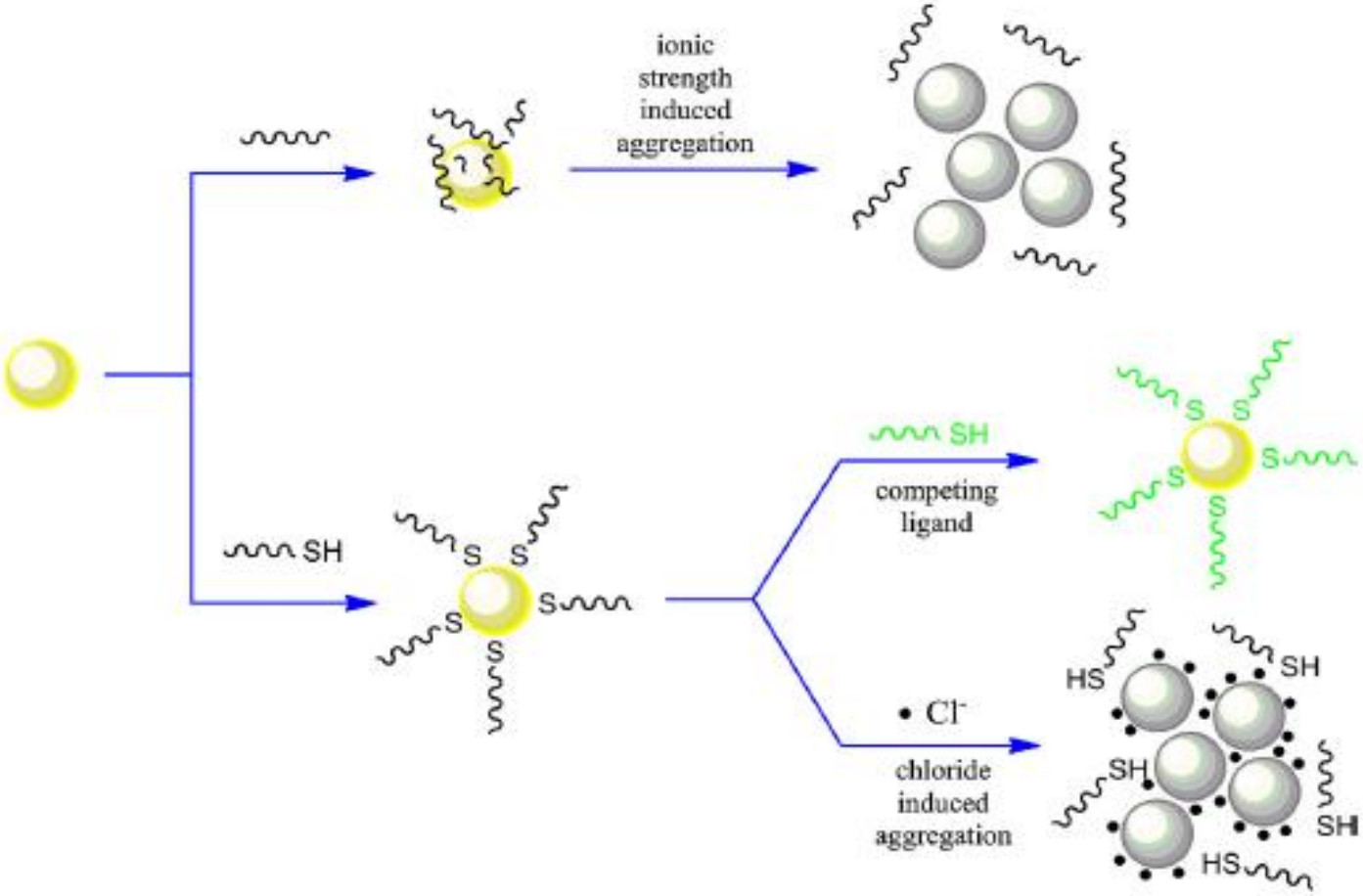
NANO SILVER
NANO SILVER

DANGER?
NANOPARTICLES

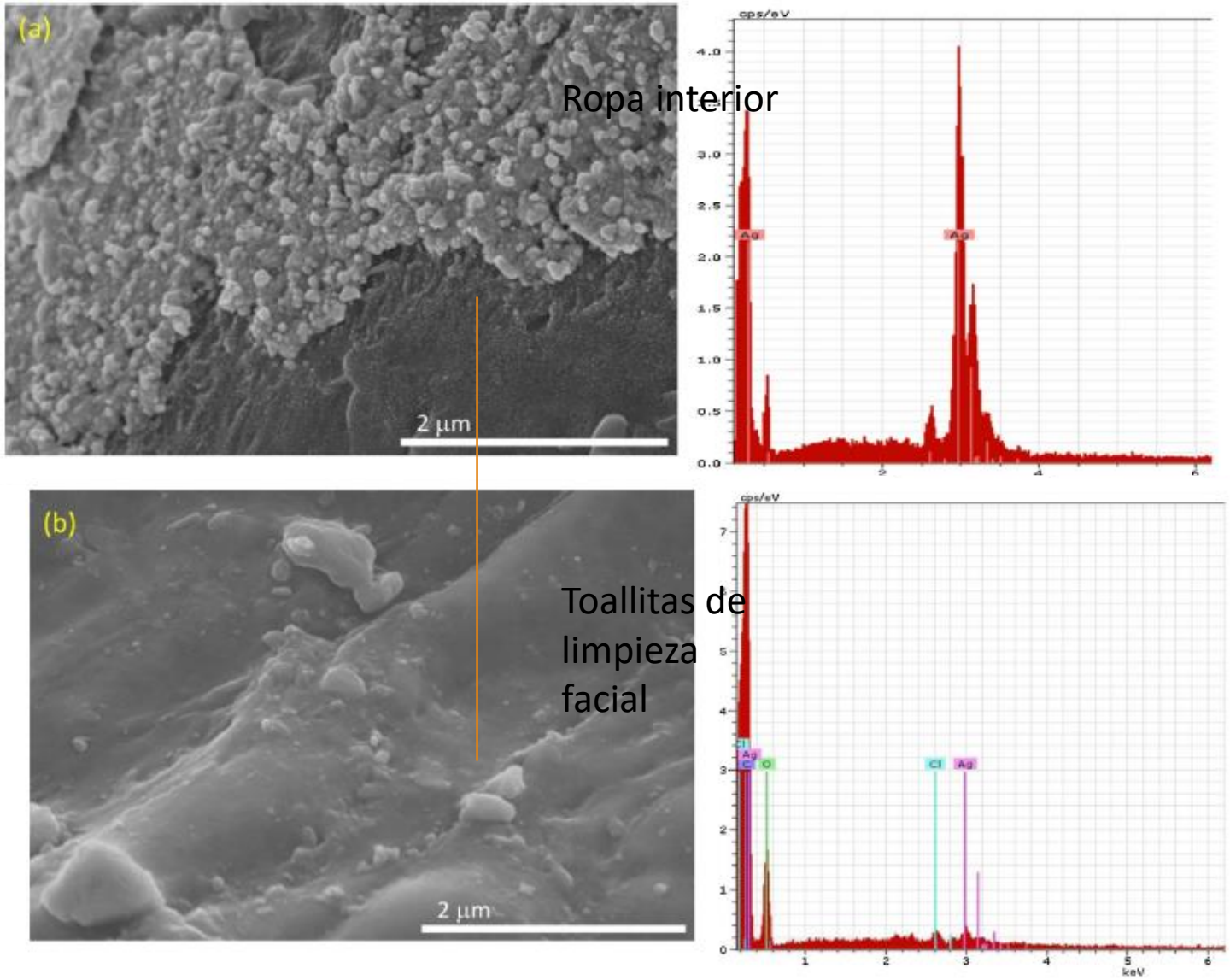
Salud y seguridad

Contaminante común	**Contaminante “nano”**
Identificación de la naturaleza	Identificación de la naturaleza
concentración	Caracterización • Tamaño medio y distribución de tamaño • Forma • Estado de aglomeración • Superficie específica • Química superficial • Densidad de carga

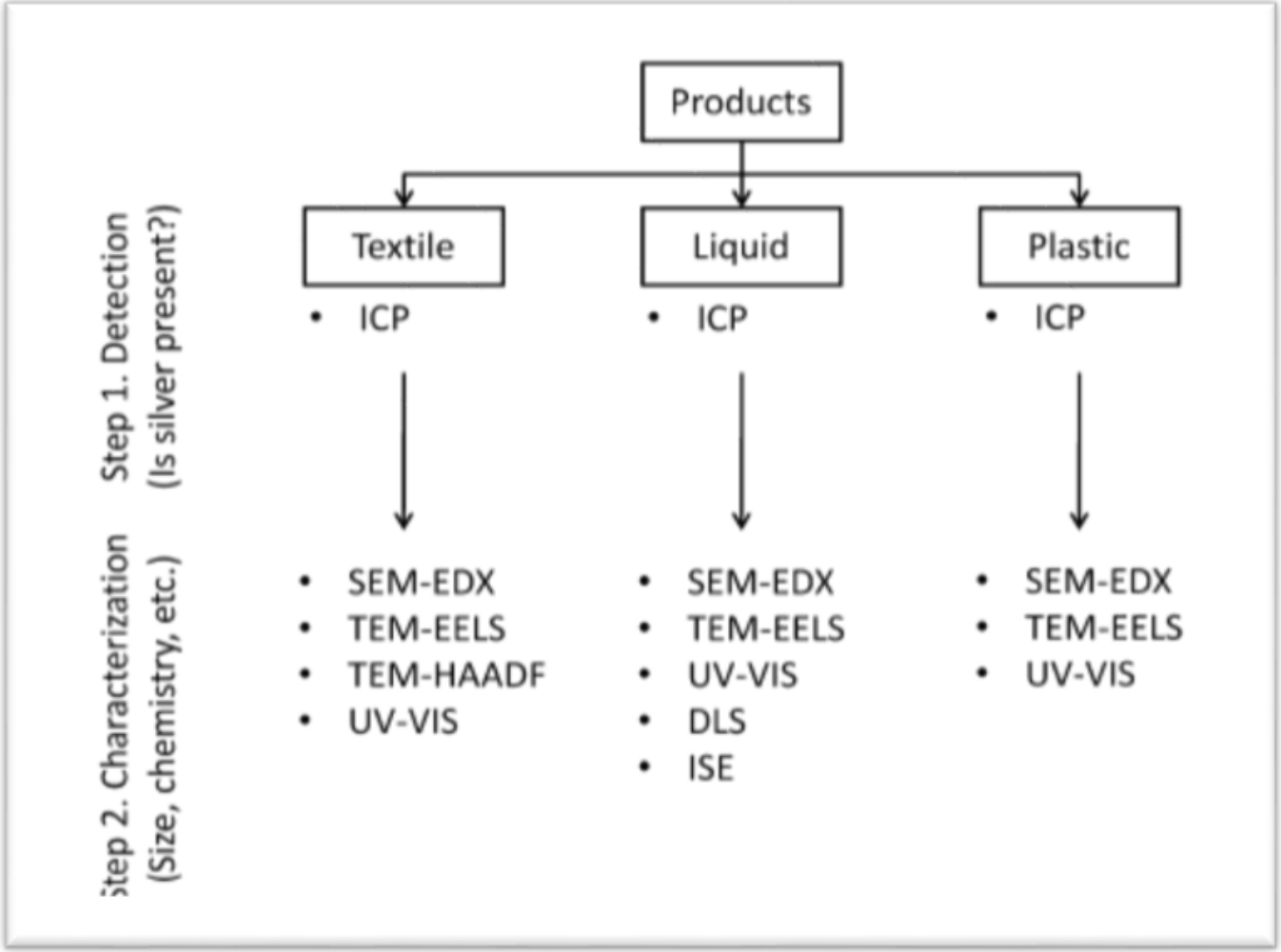
Intercambio de ligando



Botasini, Méndez, Anal. Chim. Acta 800 (2013) 1



Tulve et al., Int. J. Hyg. Environ. Health (2015)



Tulve et al., Int. J. Hyg. Environ. Health (2015)

Material de referencia

NIST RM 8017

El 4 de Febrero de 2015, el NIST presenta el primer reporte de su nuevo material de referencia: **nanopartículas de plata recubiertas con polivinilpirrolidona**.

Es el único material de referencia existente de nanopartículas de plata

National Institute of Standards & Technology

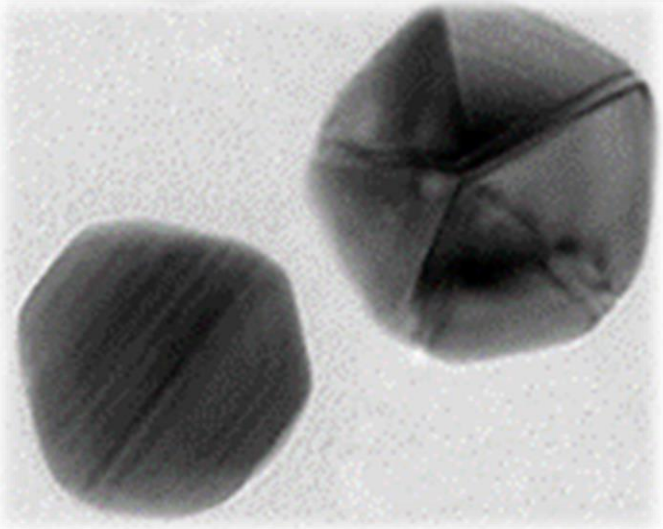
Report of Investigation

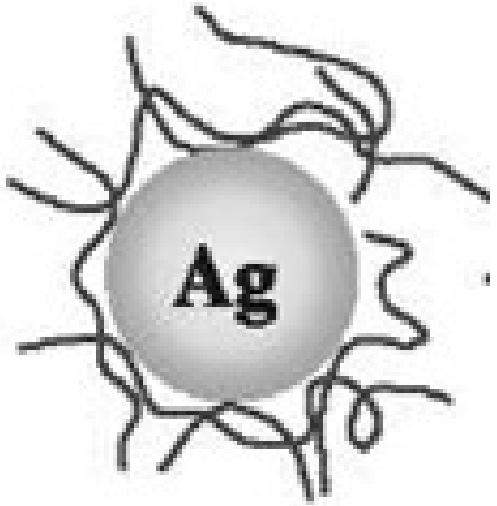
Reference Material 8017

Polyvinylpyrrolidone Coated Silver Nanoparticles

(Nominal Diameter 75 nm)

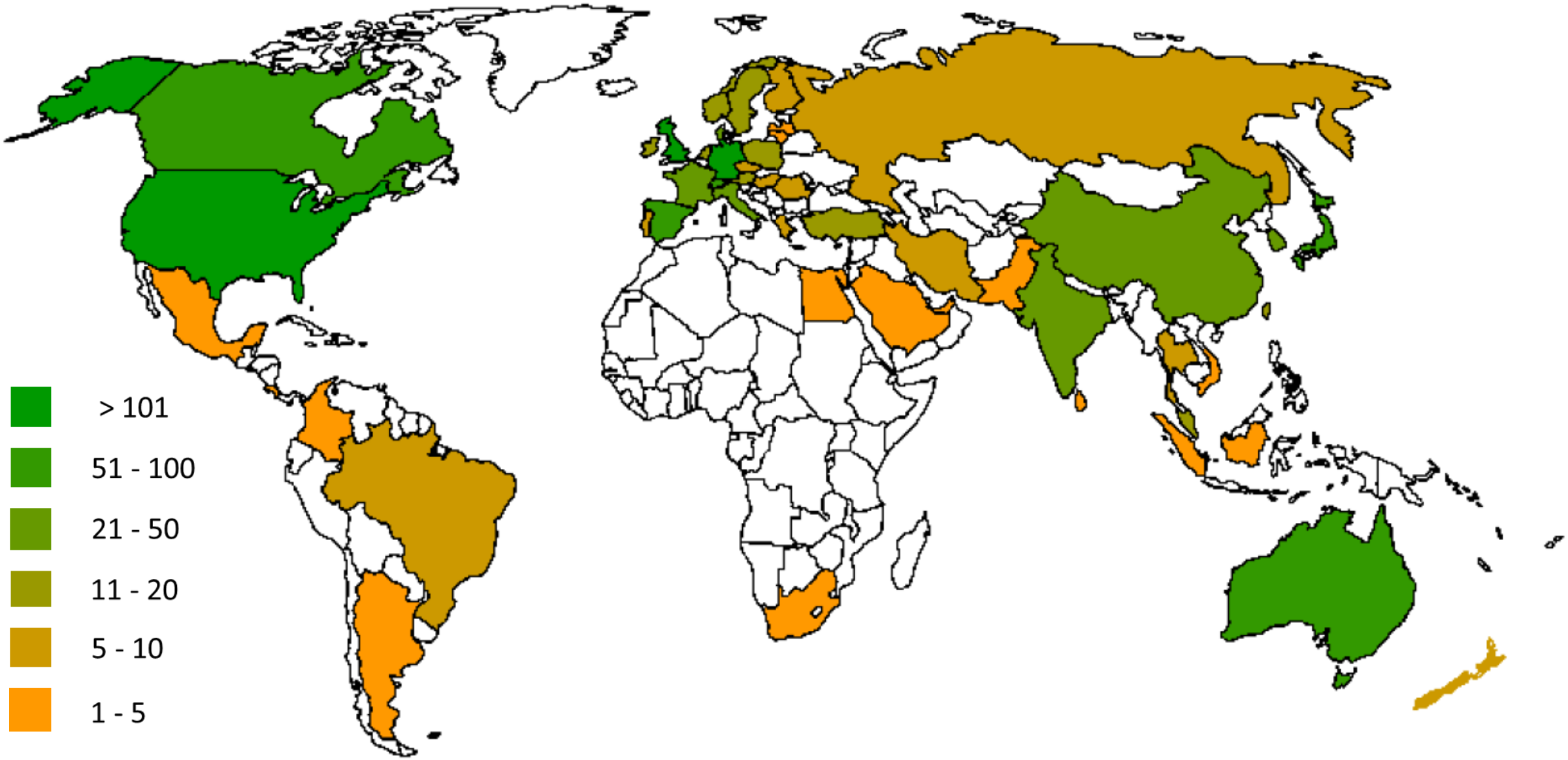
This Reference Material (RM) is intended primarily for use as a benchmark and investigative tool for the evaluation of potential environmental, health, and safety risks that may be associated with manufactured nanomaterials during their product life-cycle. A unit of RM 8017 consists of five serum vials containing a lyophilized polyvinylpyrrolidone (PVP)-coated silver (Ag) nanoparticle cake. Each vacuum sealed vial contains nominally 2 mg Ag and 20 mg of PVP (molar mass approximately 40 kDa). The RM must be reconstituted with 2 mL of deionized water before use; the reconstituted Ag concentration is nominally 1 mg/mL.



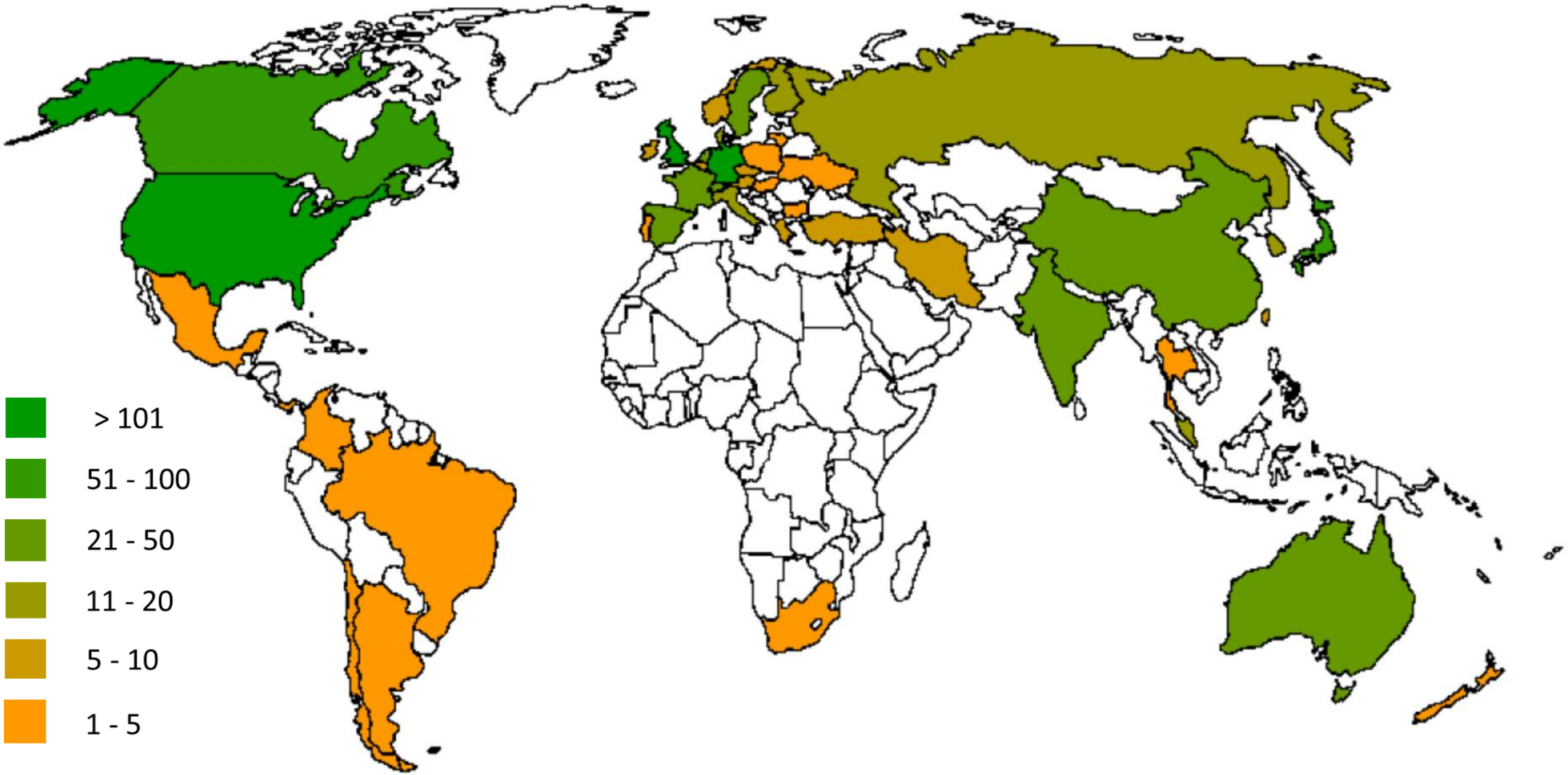


¿Cuál es la situación mundial en “nano”?

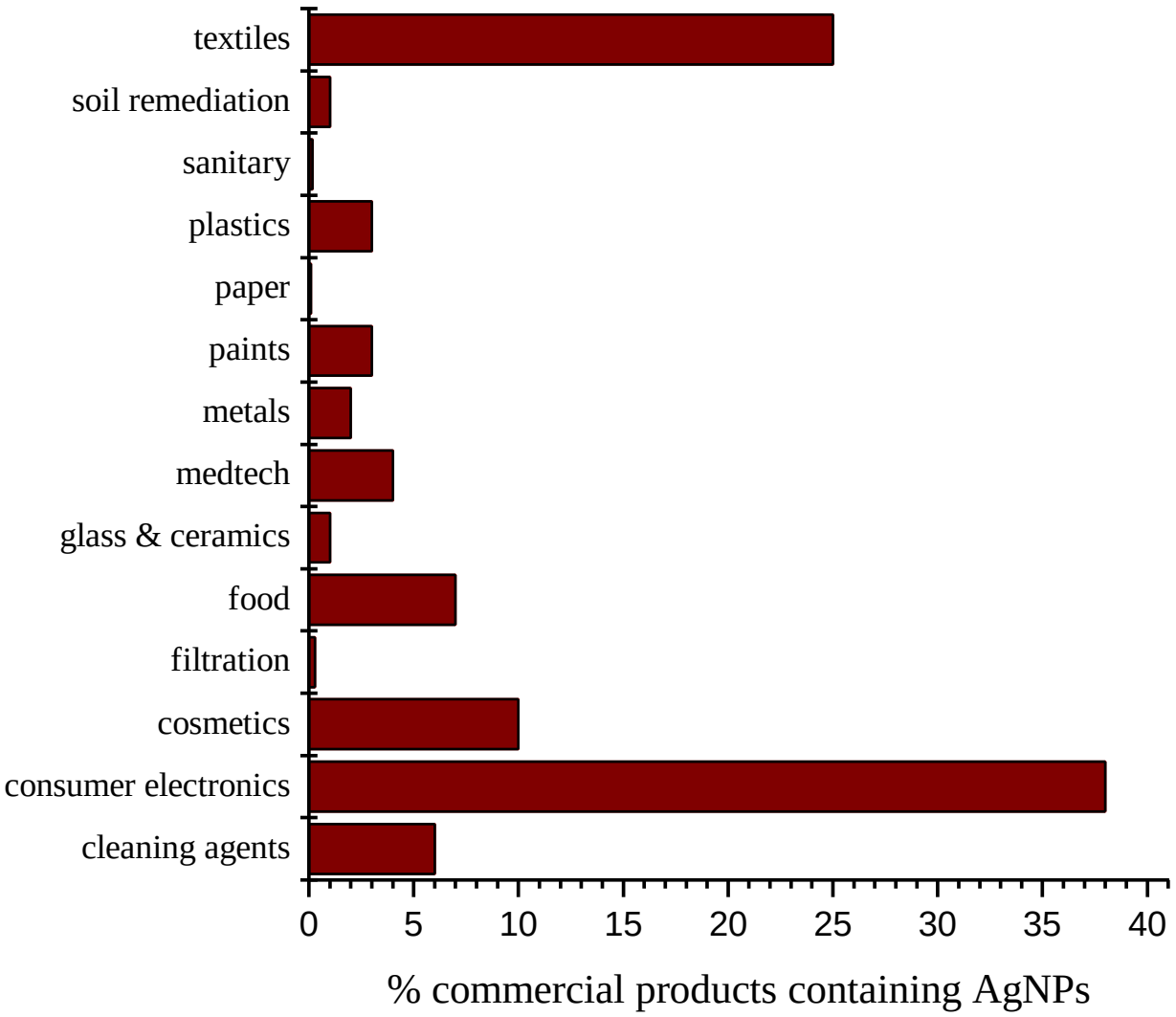
Centros de investigación en Nanotecnología



Productos comerciales basados en Nanotecnología

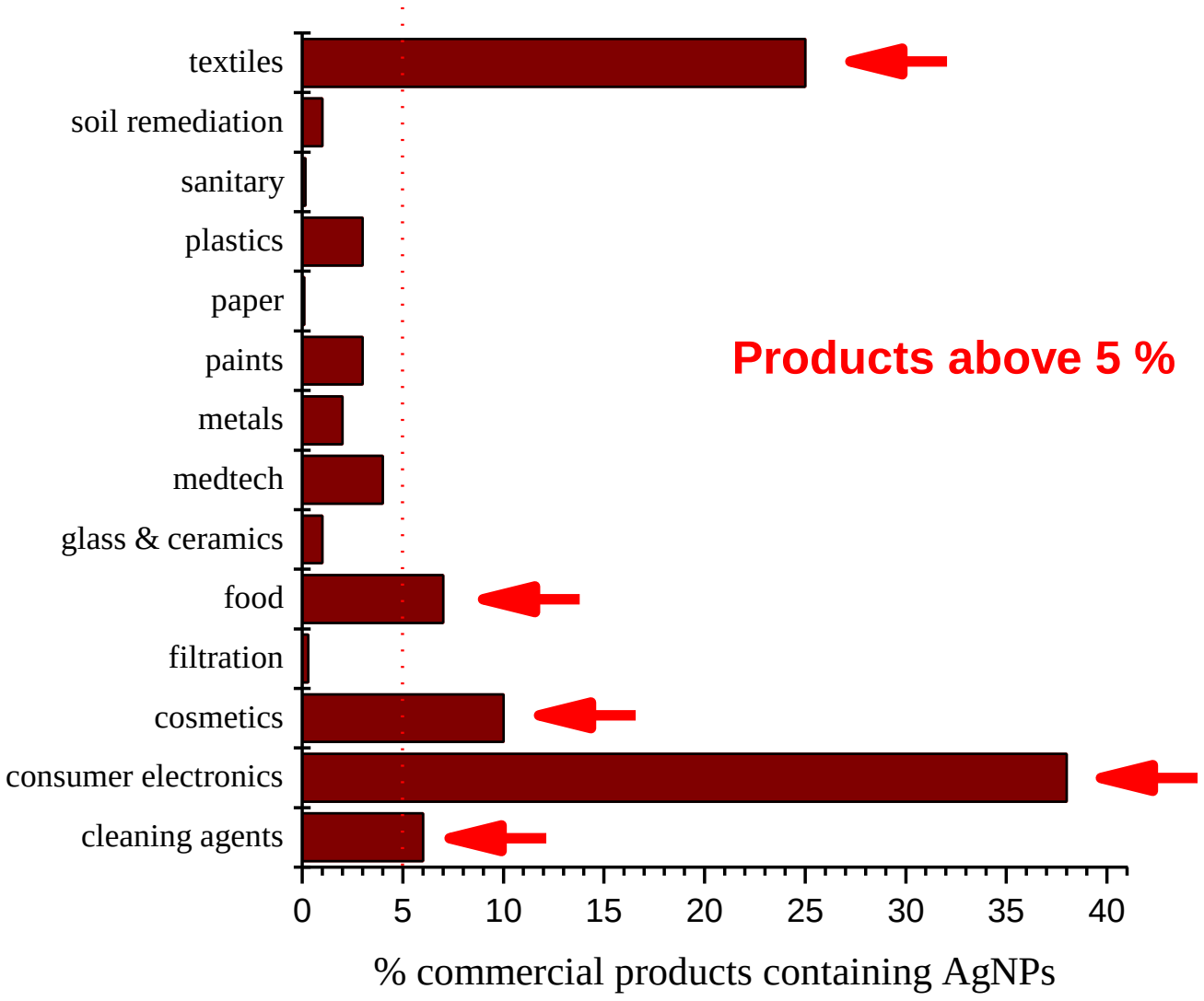


Productos comerciales conteniendo nanopartículas de plata

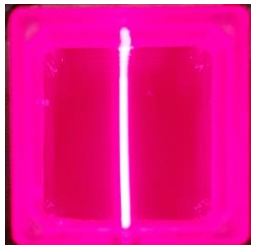


Sun et al., Environmental Pollution 185 (2014) 69

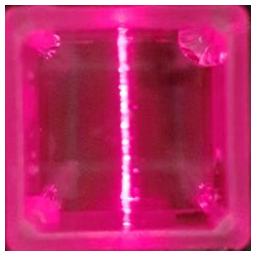
¿Qué es lo urgente?



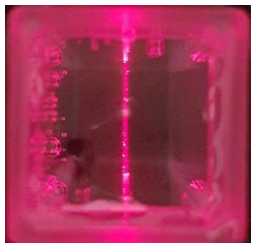
Análisis de muestras comerciales



M

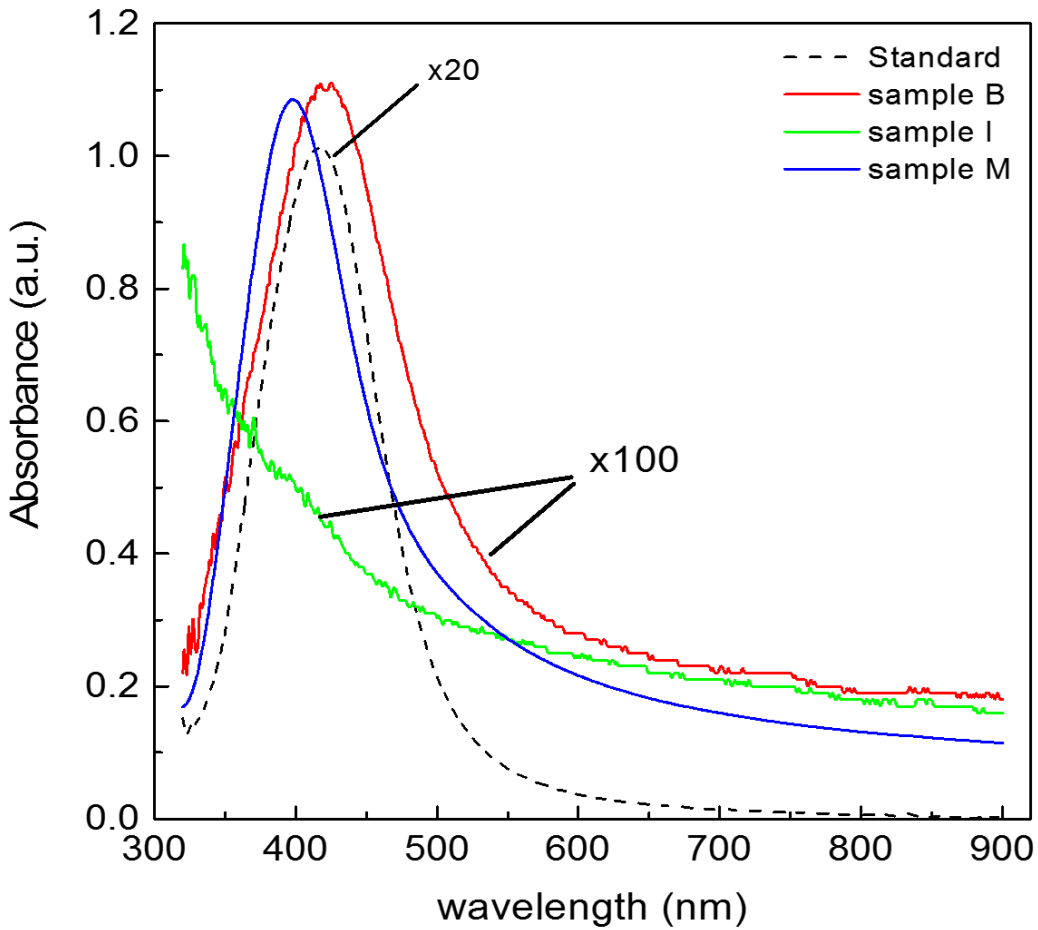


B



I

UV-Visible

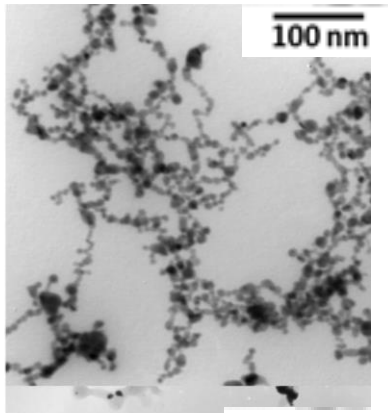


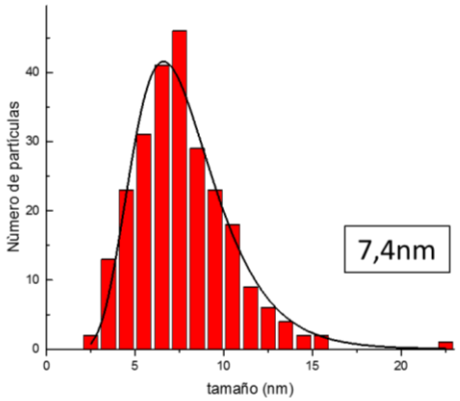
Análisis de muestras comerciales

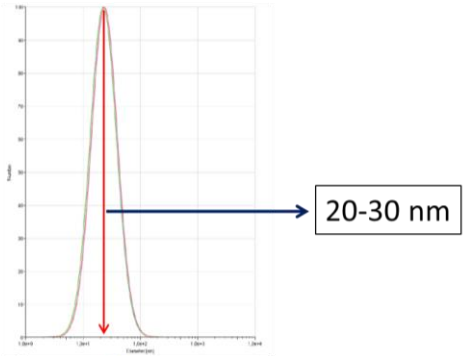
Microscopía Electrónica de Transmisión

Dispersión Dinámica de Luz

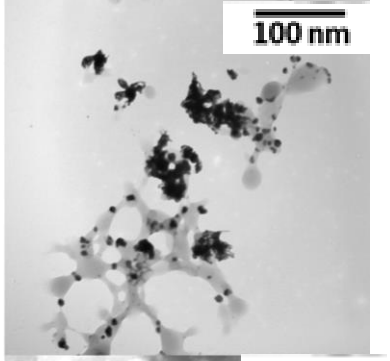
M

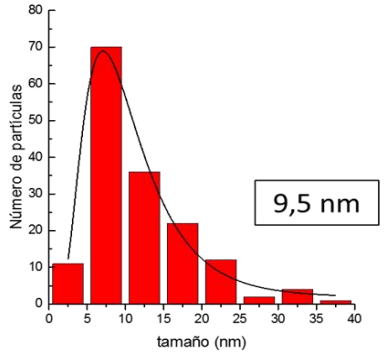


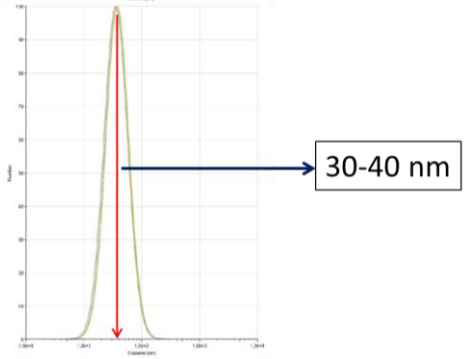




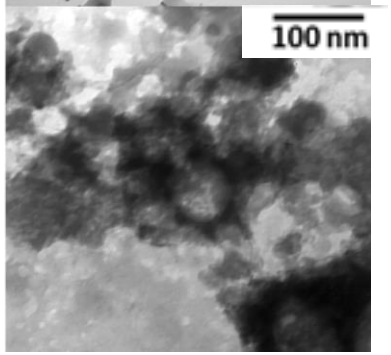
B

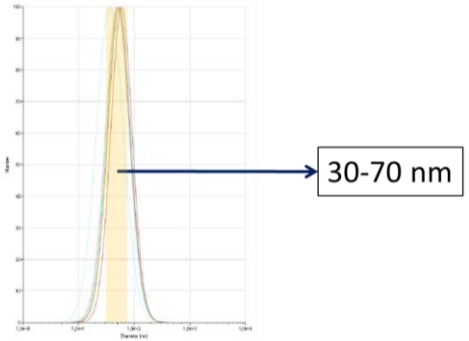




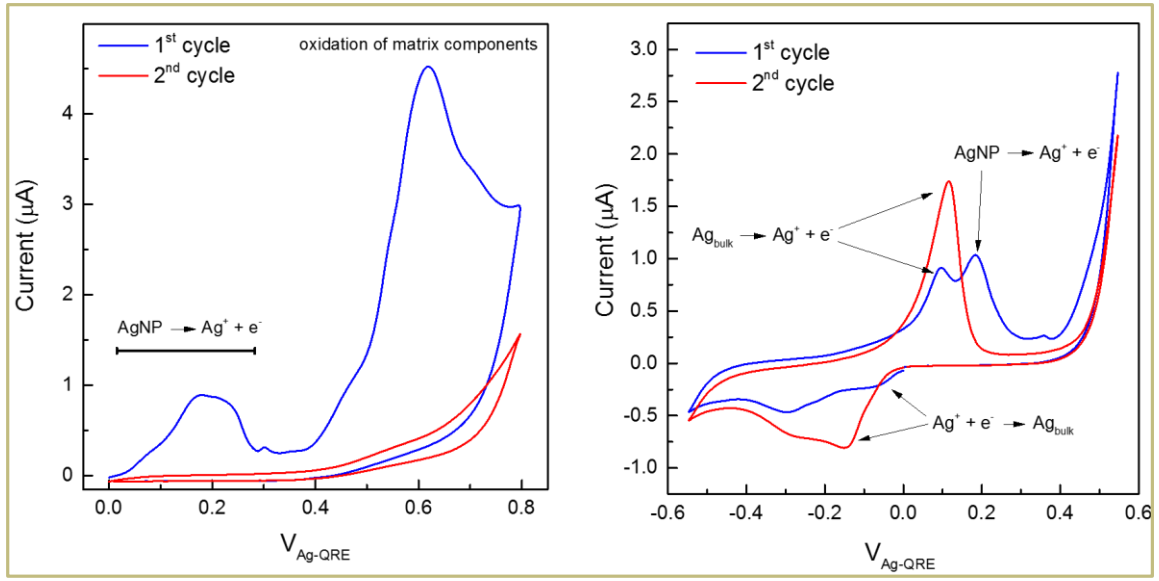


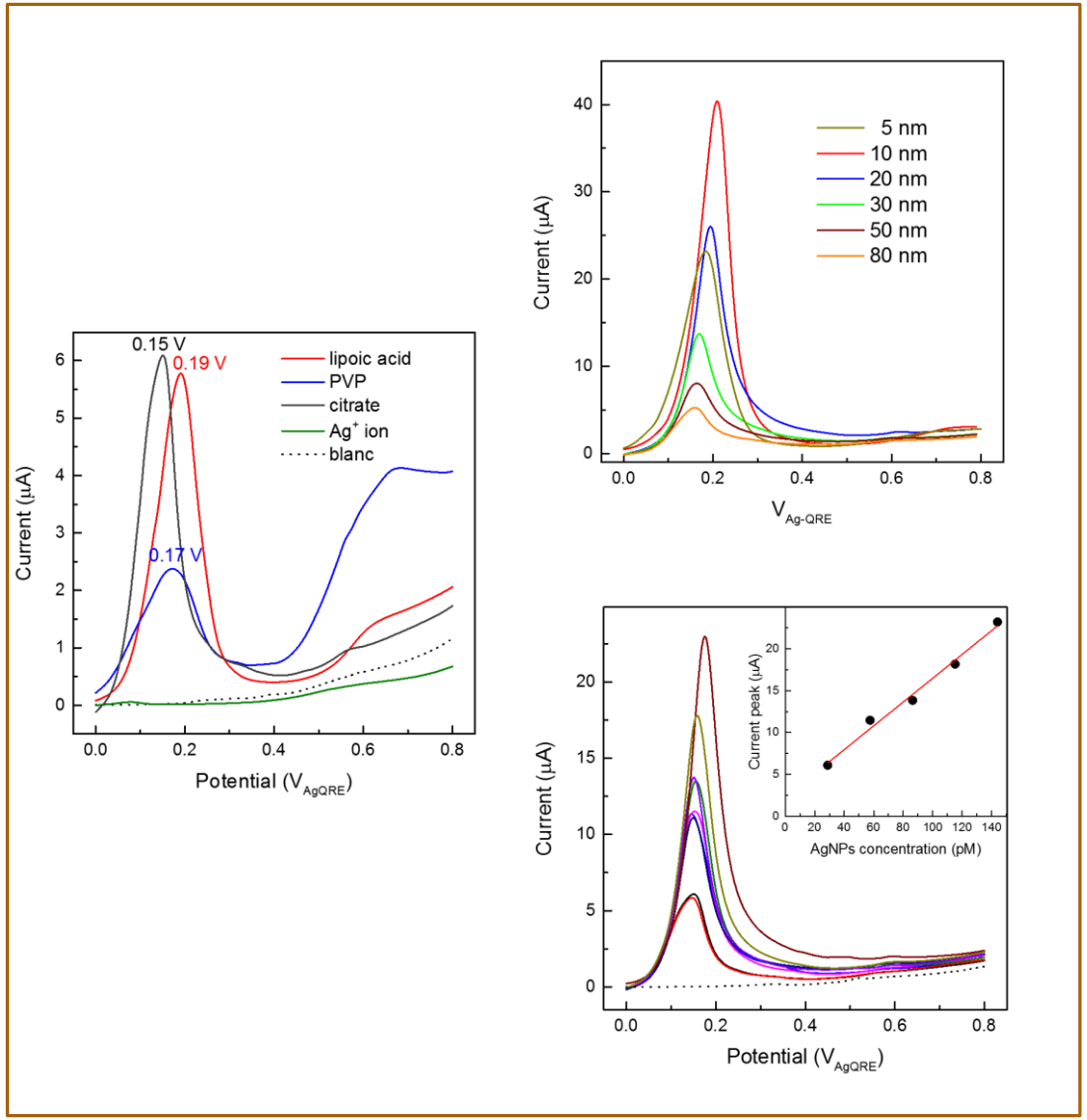
I



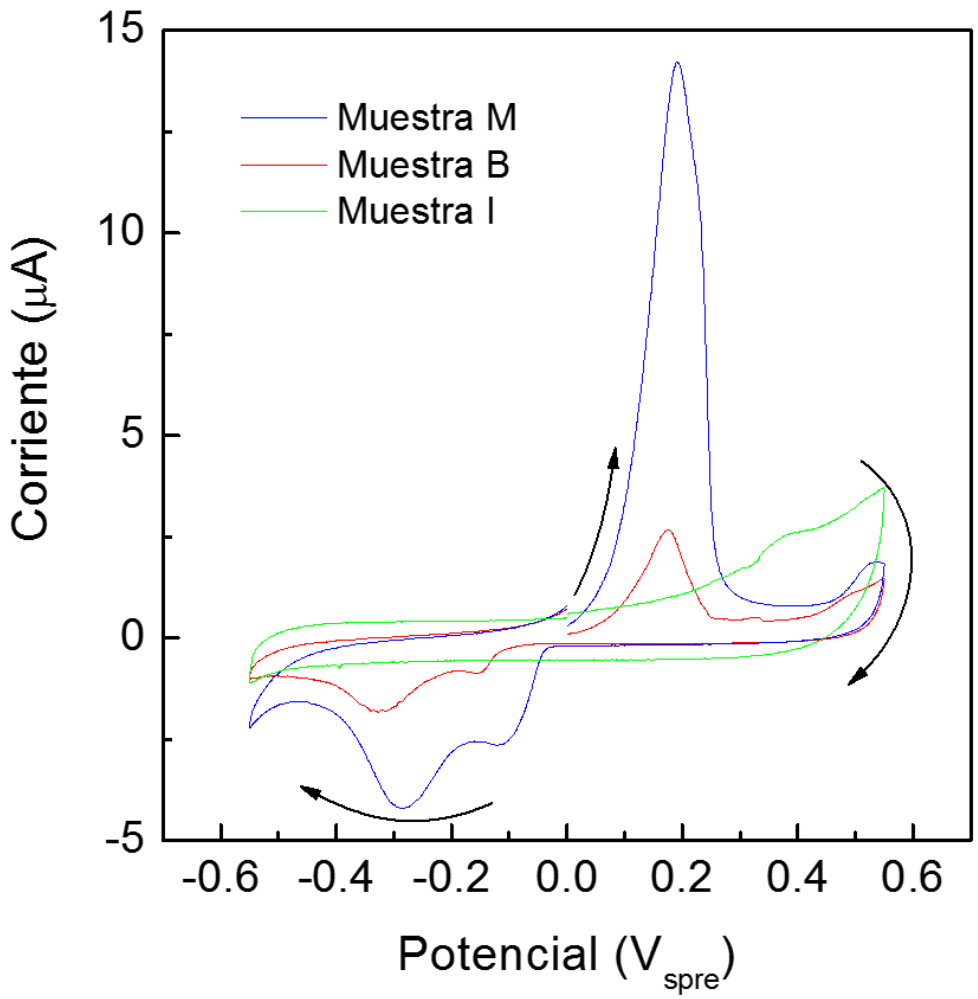


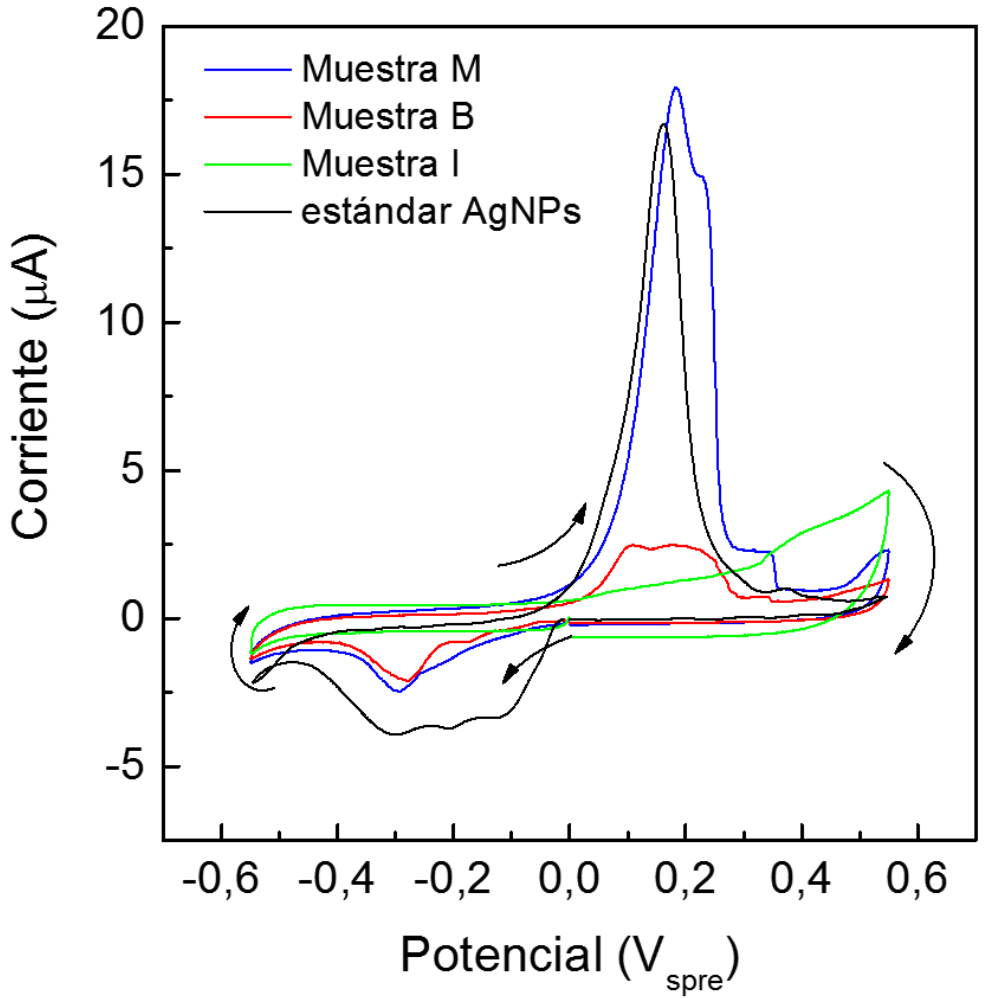
Método electroquímico desarrollado en el Laboratorio de Biomateriales



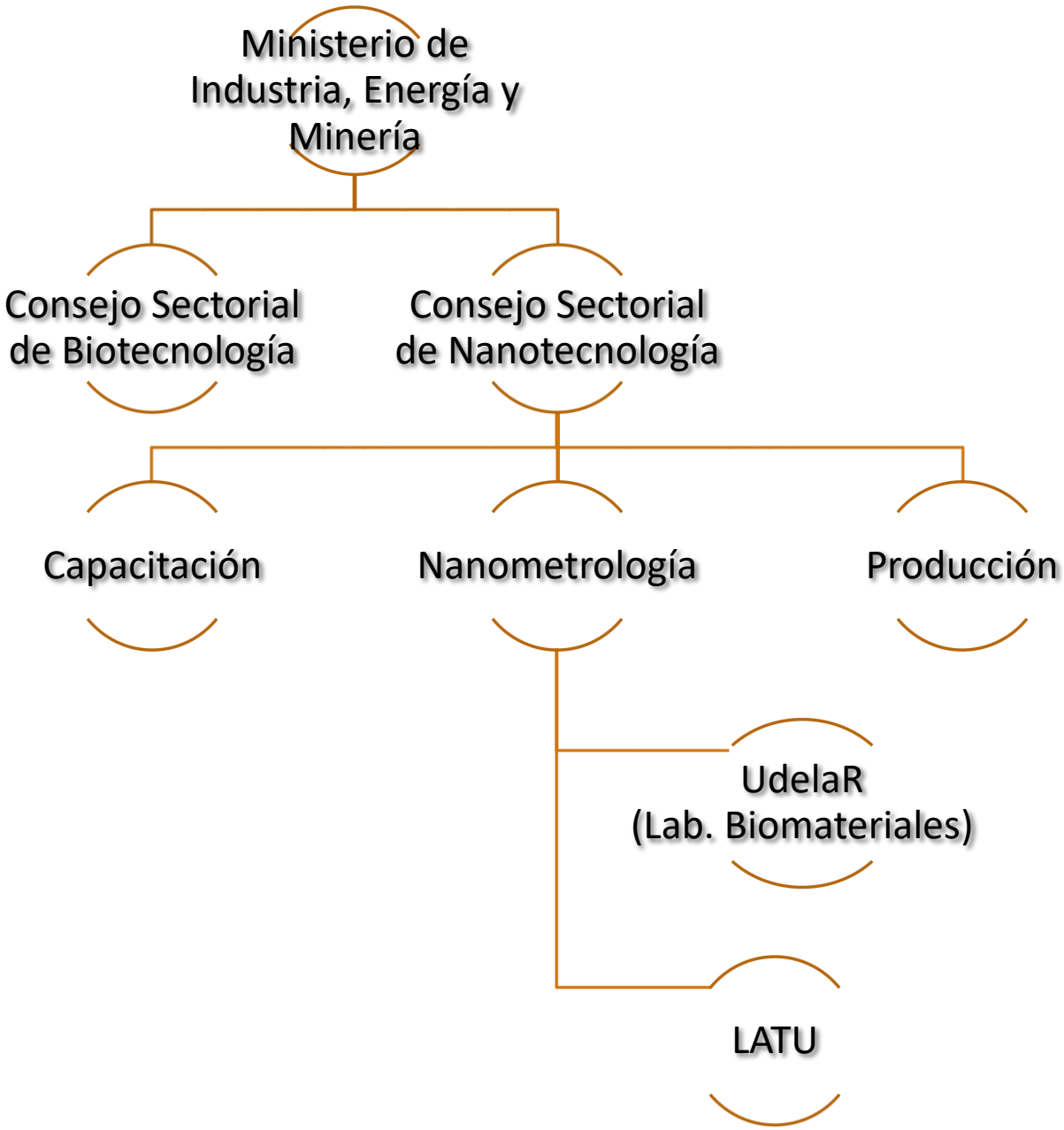


Voltamperometría Cíclica





OCÉANO ATLÁNTICO
VENEZUELA
COLOMBIA
GUYANAS
ECUADOR
BRASIL
PERÚ
BOLIVIA
PARAGUAY
OCÉANO PACÍFICO
CHILE
ARGENTINA
URUGUAY
OCÉANO ATLÁNTICO


Ministerio de Industria, Energía y Minería
Consejo Sectorial de Biotecnología
Consejo Sectorial de Nanotecnología
Capacitación
Nanometrología
Producción
UdelaR (Lab. Biomateriales)
LATU

Agradecimientos

- Dr. Santiago Botasini
- Lic. Pablo Tancredi

Dra. María F. Cerdá, Lic. Aldana Grimaldi,

M.Sc. Gonzalo Heijo, M.Sc. Gonzalo Pérez,

Dra. Mariana Pereyra, Lic. Marcos Navatta,

Lic. Paula Enciso, Lic. Laura Luzuriaga

- Comisión Sectorial de Investigación Científica (UdelaR)
- Fondo Clemente Estable (ANII - MEC)
- Laboratorio Tecnológico del Uruguay (LATU)
- PEDECIBA (MEC)