A low-cost and a sustainable process for the recovery of Tantalum from electronical components

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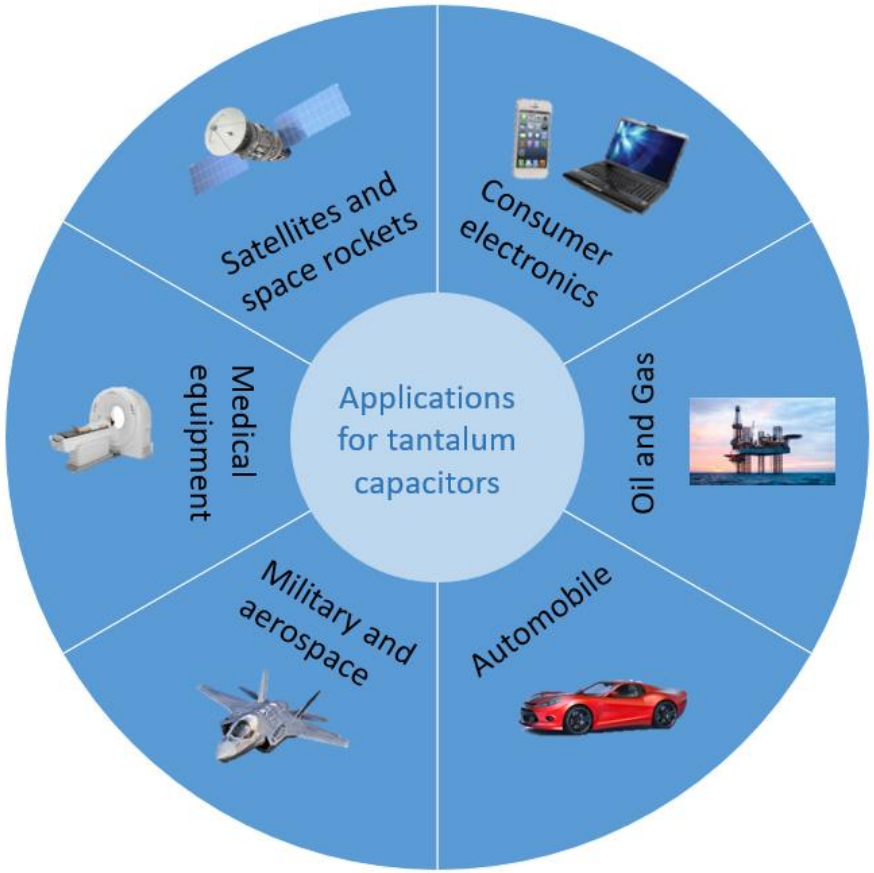
PROMETIA

Introduction

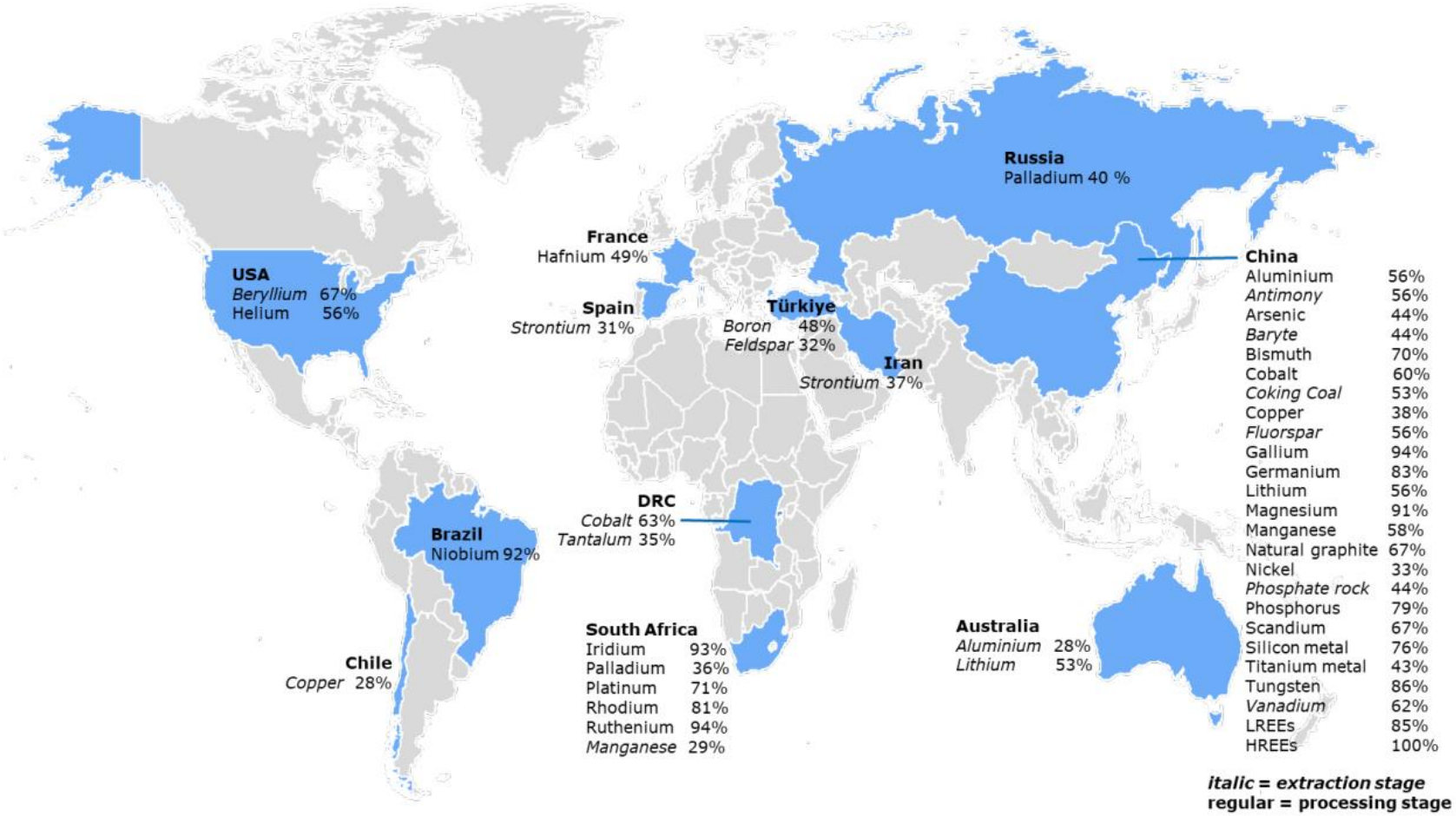
Why Tantalum ?

- Large capacitance per unit volume
- Exceptional stability and reliability in a wide range of temperatures and frequencies.

The first choice for the fabrication of capacitors



Tantalum CRM



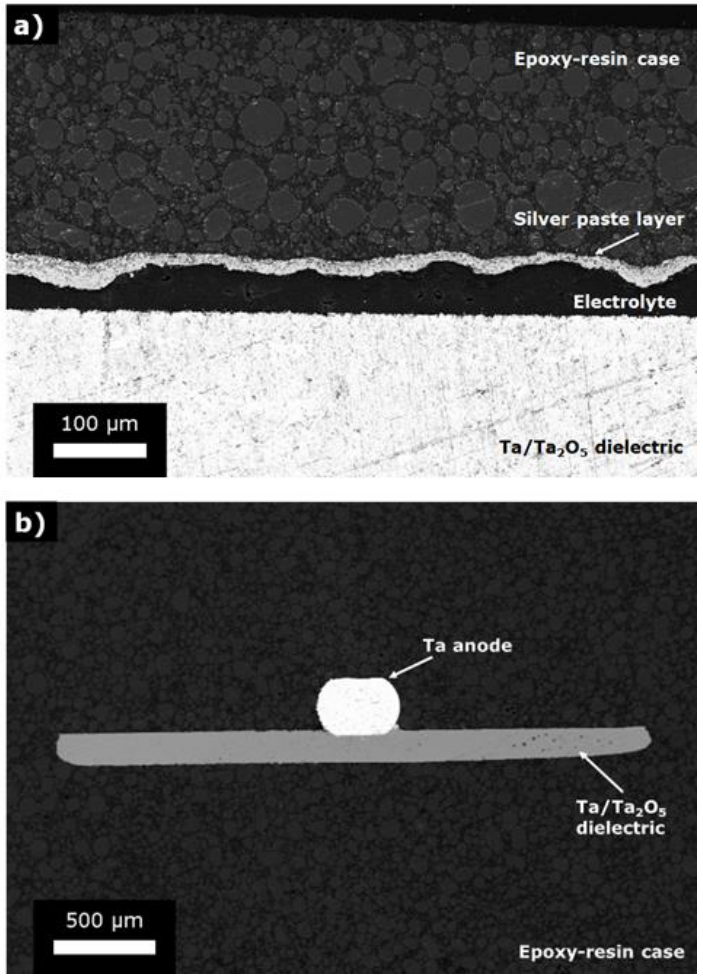
SR = 1.3

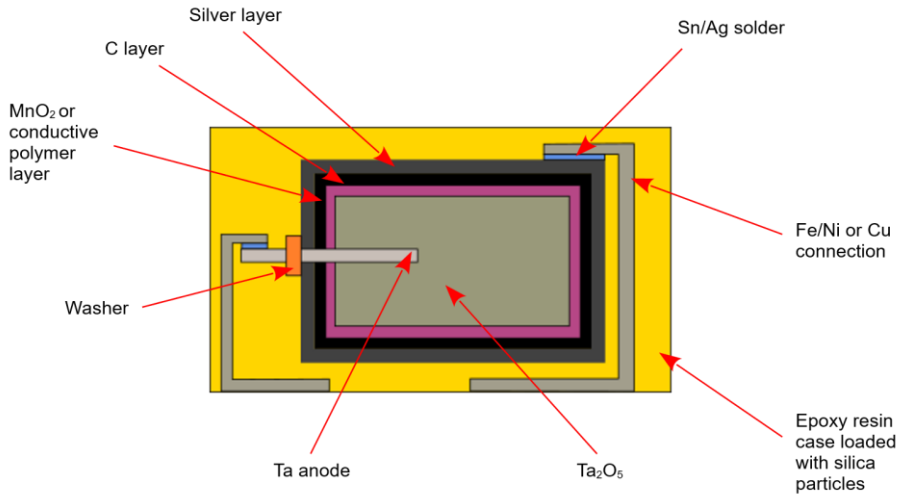
EI = 4.8

Tantalum	Extraction		
		Congo, D.R.	35%
		Rwanda	17%
		Brazil	16%
		Nigeria	11%

EoL-RIR = 1%

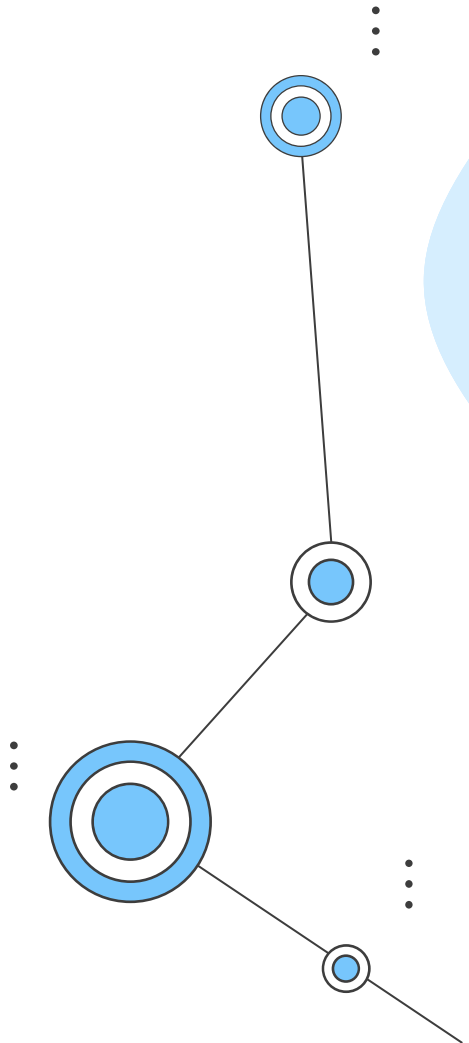
Tantalum Capacitor composition

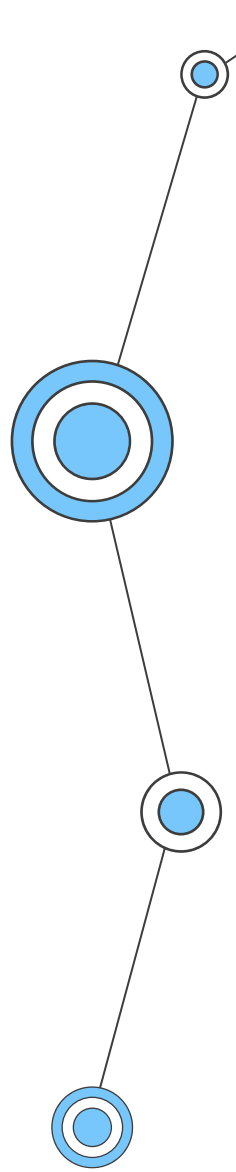




Element	%wt
Ta/Ta_2O_5	20-24%
Mn	5-8%
Ag	1-2%
C	0.5-1%
Fe/Ni	15-18%
SiO_2 +Polimeri	47-52%

Recovery process





Ta capacitors

Size reduction

X

physical-mechanical processing

Magnetic separation

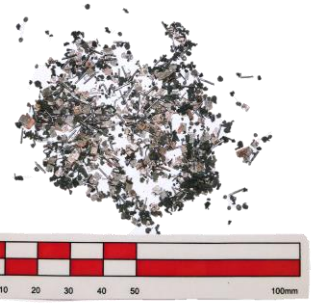
Magnetic

Fe/Ni electrodes

Non-magnetic

Size classification

> 0.180 mm



Cu electrodes

< 0.180 mm

Electrostatic separation

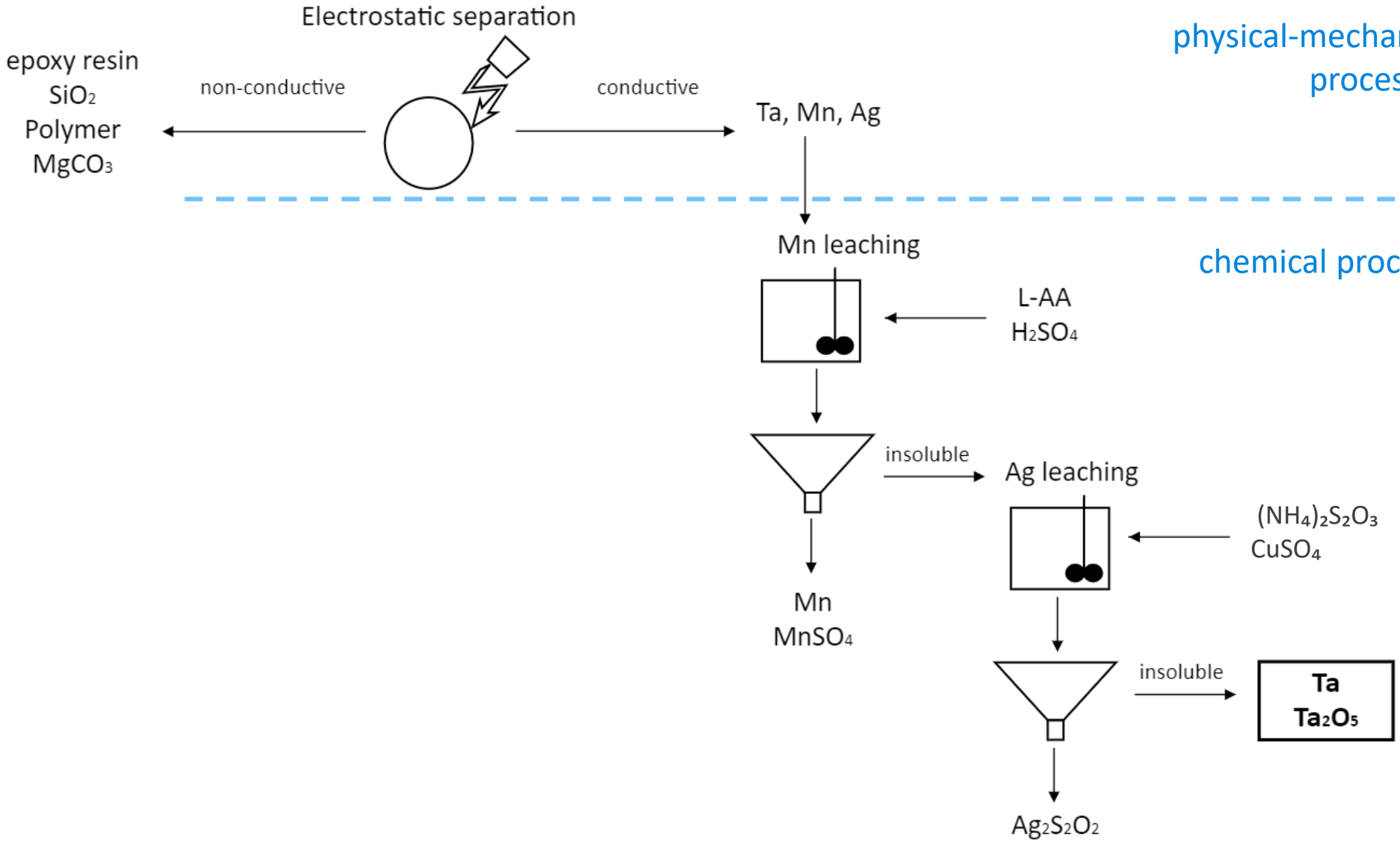
epoxy resin
SiO_2
Polymer
$MgCO_3$

non-conductive

conductive

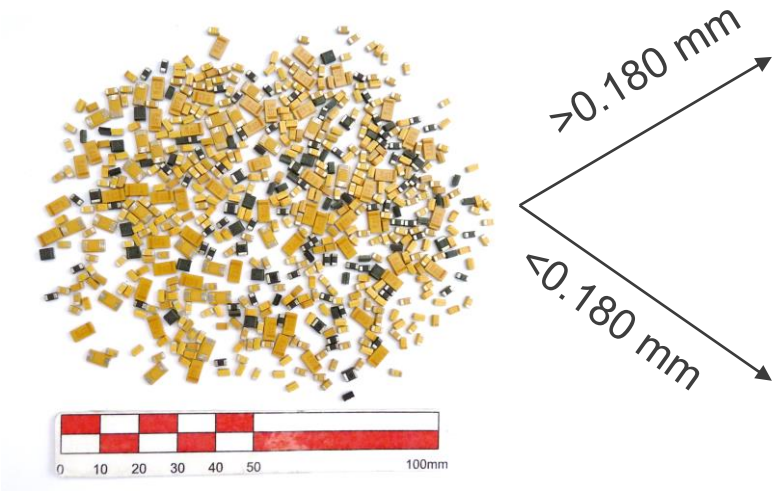
Ta, Mn, Ag

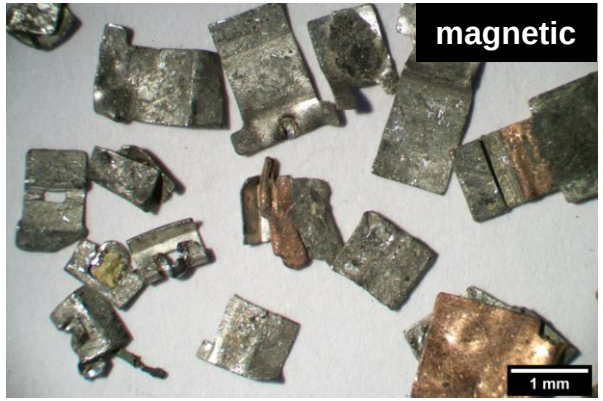
chemical processing


Electrostatic separation
epoxy resin
SiO2
Polymer
MgCO3
non-conductive
conductive
Ta, Mn, Ag
physical-mechanical processing
chemical processing
Mn leaching
L-AA
H2SO4
insoluble
Ag leaching
(NH4)2S2O3
CuSO4
Mn
MnSO4
insoluble
Ta
Ta2O5
Ag2S2O2

Physical-mechanical processing

Size reduction and magnetic separation

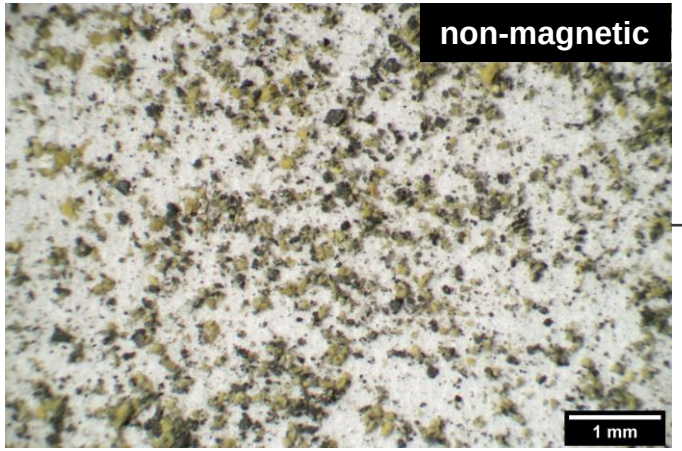




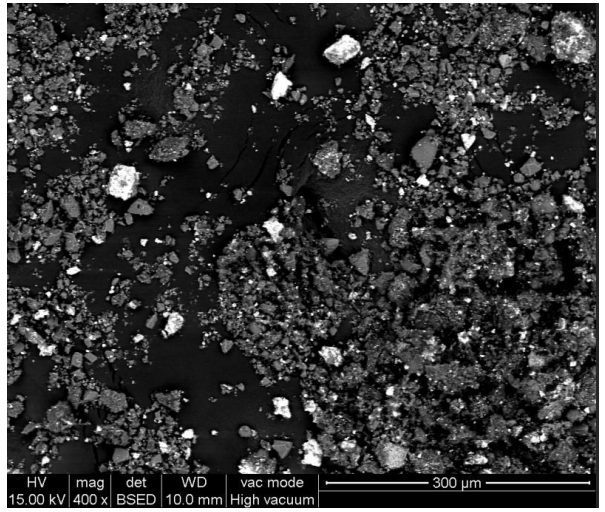
Size reduction and magnetic separation

>0.180 mm

<0.180 mm



SEM analysis

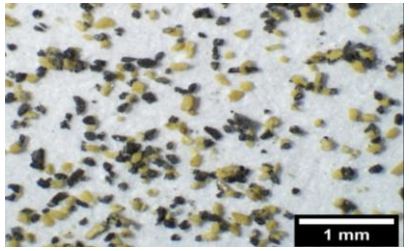


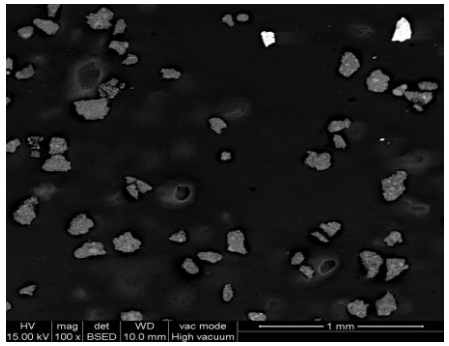
Ta = 24.2 %
Mn = 6.7 %
O = 46%

Si = 22.1 %
Ag = 1 %

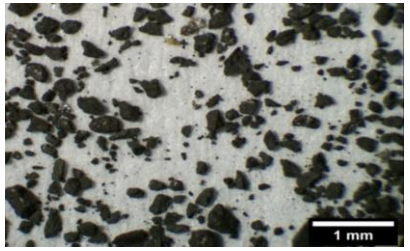
Electrostatic separation

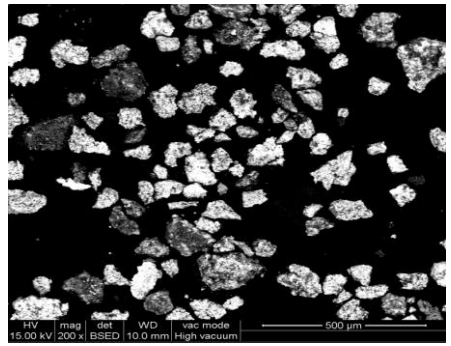
non-conductive



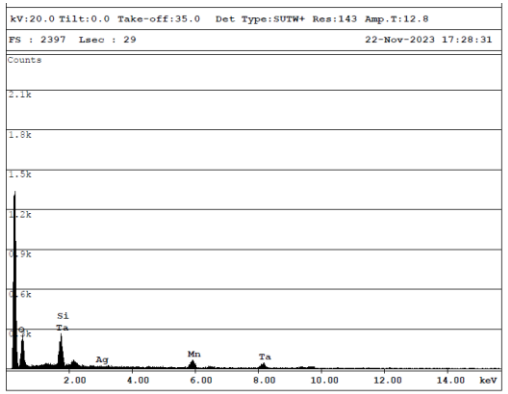


conductive



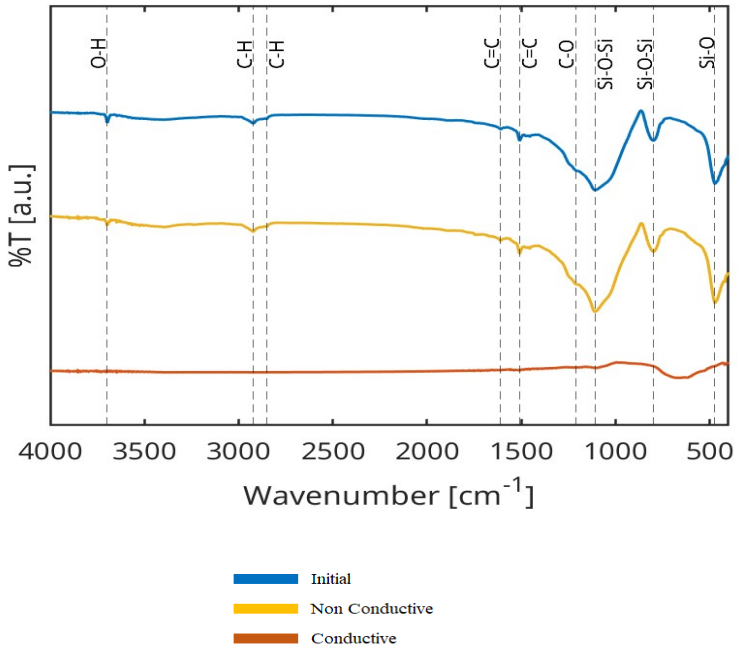


SEM analysis

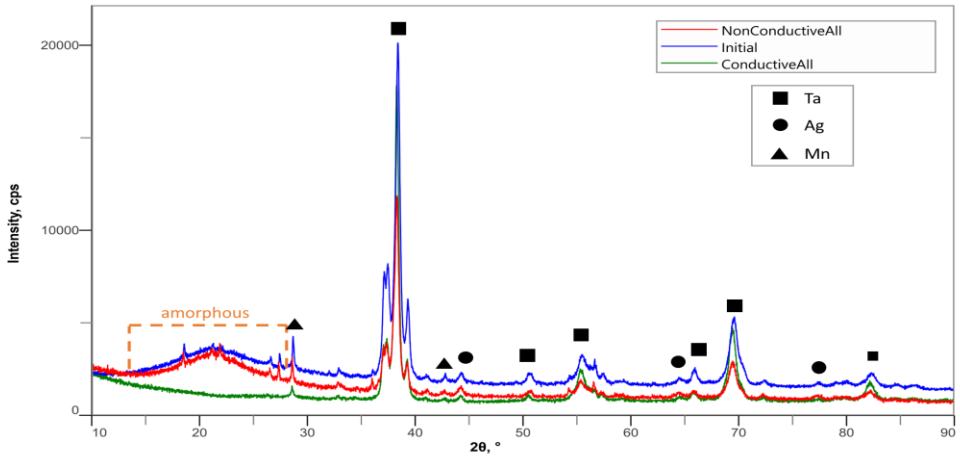


Ta = 53.4 %
Si = 0.4 %
Mn = 13.2 %
Ag = 0.8 %
O = 31.7%

FTIR



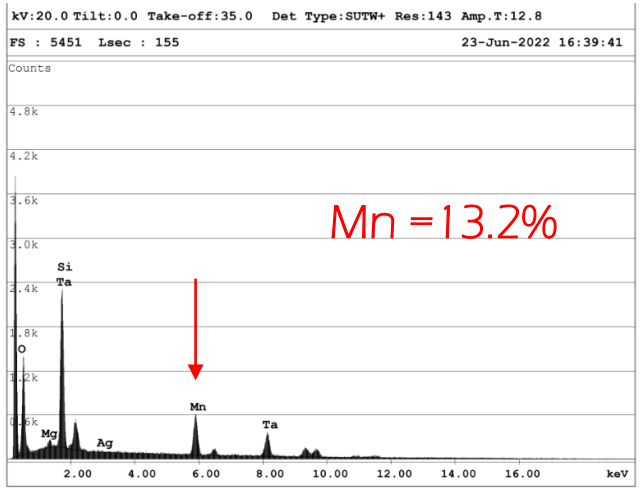
XRD

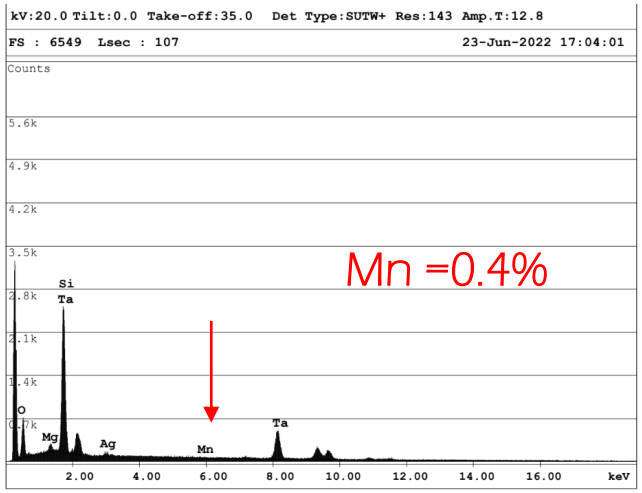


Chemical processing

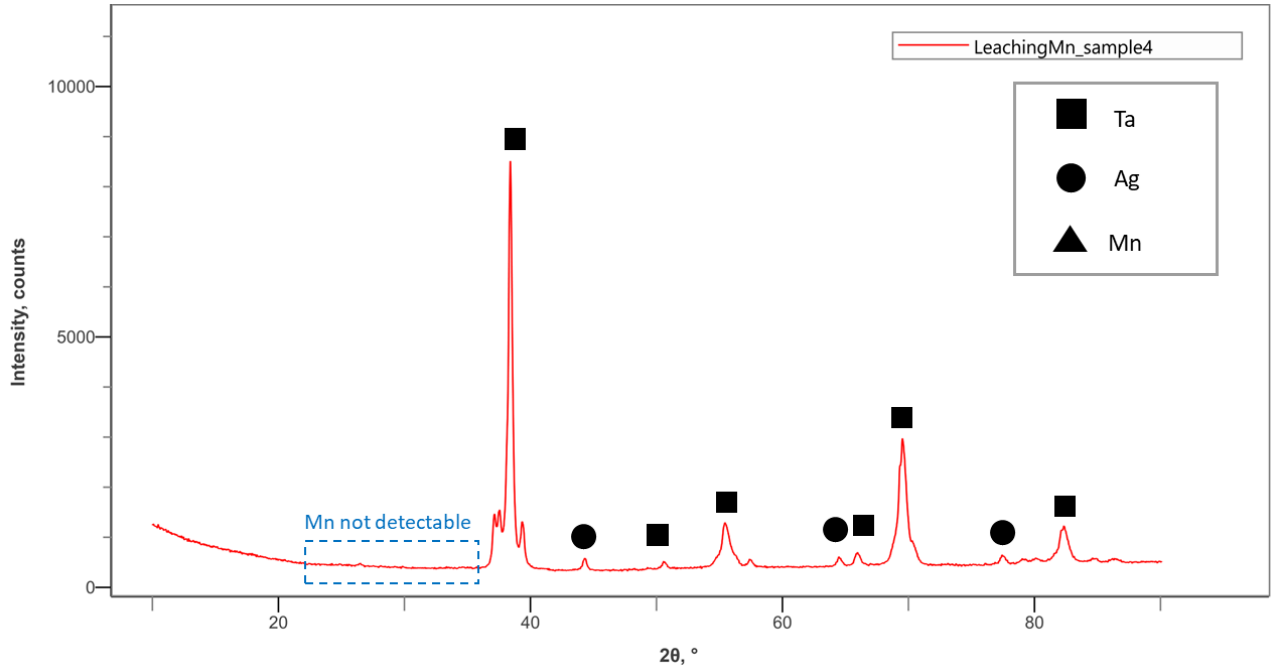
Mn Leaching

SEM analysis



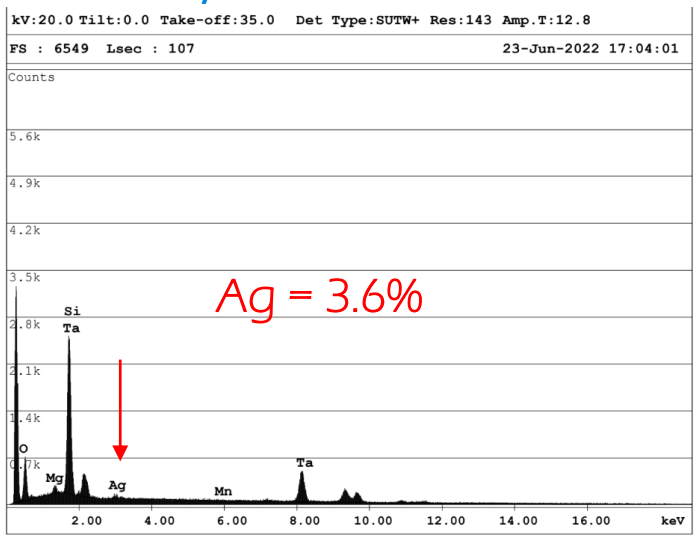


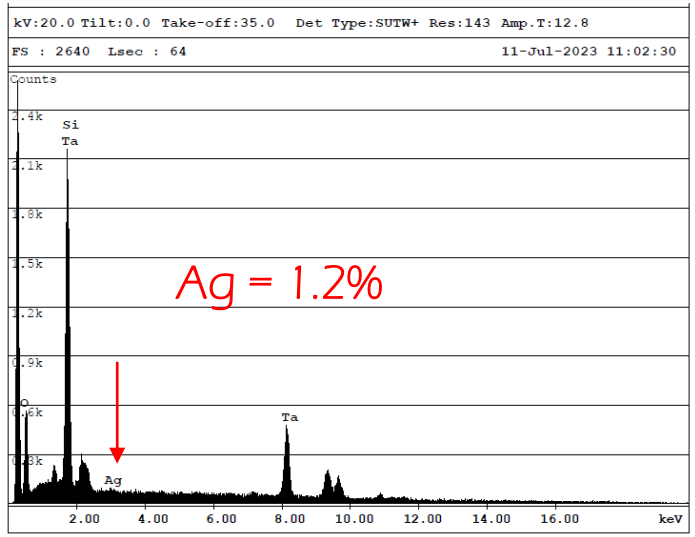
Ascorbic acid as reducing agent in sulfuric acid medium



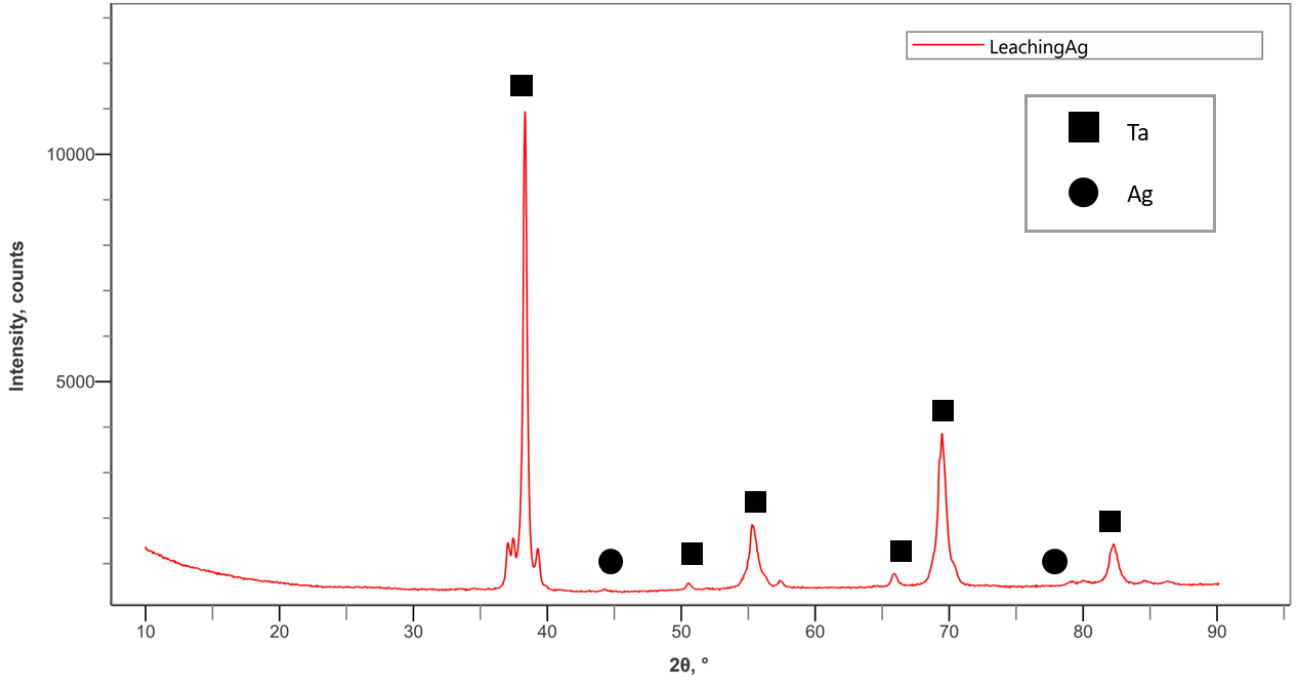
Ag Leaching

SEM analysis

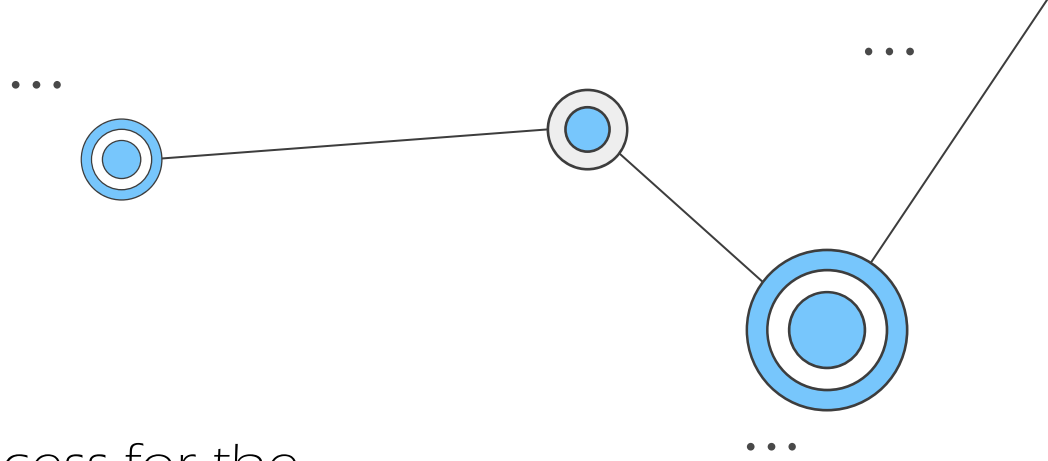




Ammonium thiosulfate, ammonia and copper sulfate



Conclusions



- ✓ We developed a low-cost, sustainable process for the recovery of Ta from e-waste
- ✓ The process has a recovery rate of about 60% and the final powder has high purity of Ta /Ta2O5 (around 96%)
- ✓ All the results must be confirmed by ICP-OES/ICP-MS to give reliable quantification of metals concentrations in each sample

Thank you !

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