

Process for the recovery of raw materials from WEEE – applied technologies and innovative processes

Modul 2 – Science and Engineering



WEEE recovery and treatment plants



<https://www.youtube.com/watch?v=GCozwMZ3QaY>



This activity has received funding from the European Institute of Innovation and Technology (EIT), a body of the European Union, under the Horizon 2020, the EU Framework Programme for Research and Innovation

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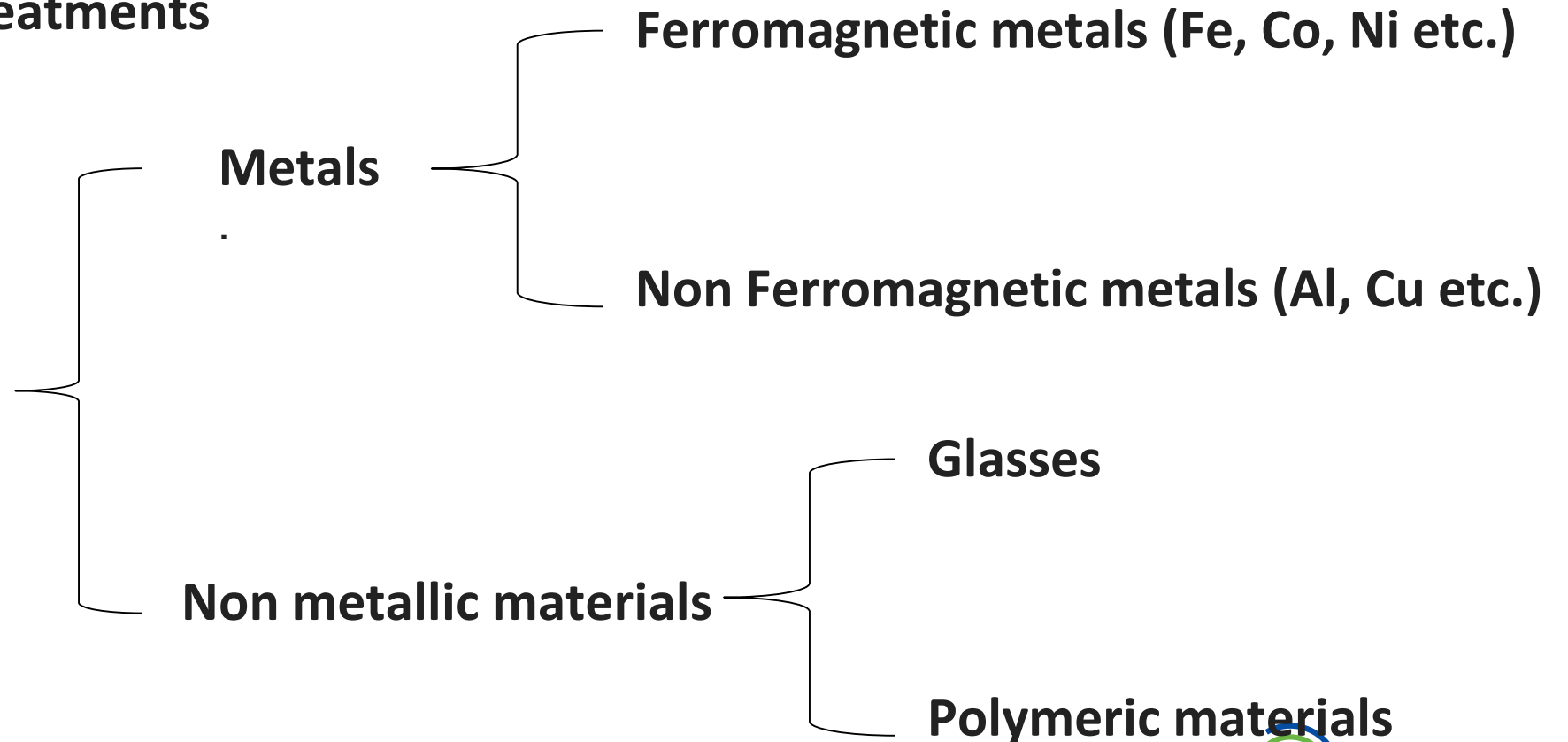
The recovery of materials from WEEE

Manual separation of components

Manual screening of materials and recovery of special materials (dust, gas etc.)

Mechanical gritting treatments
(hammer mill)

Mechanical recovery
of ground materials



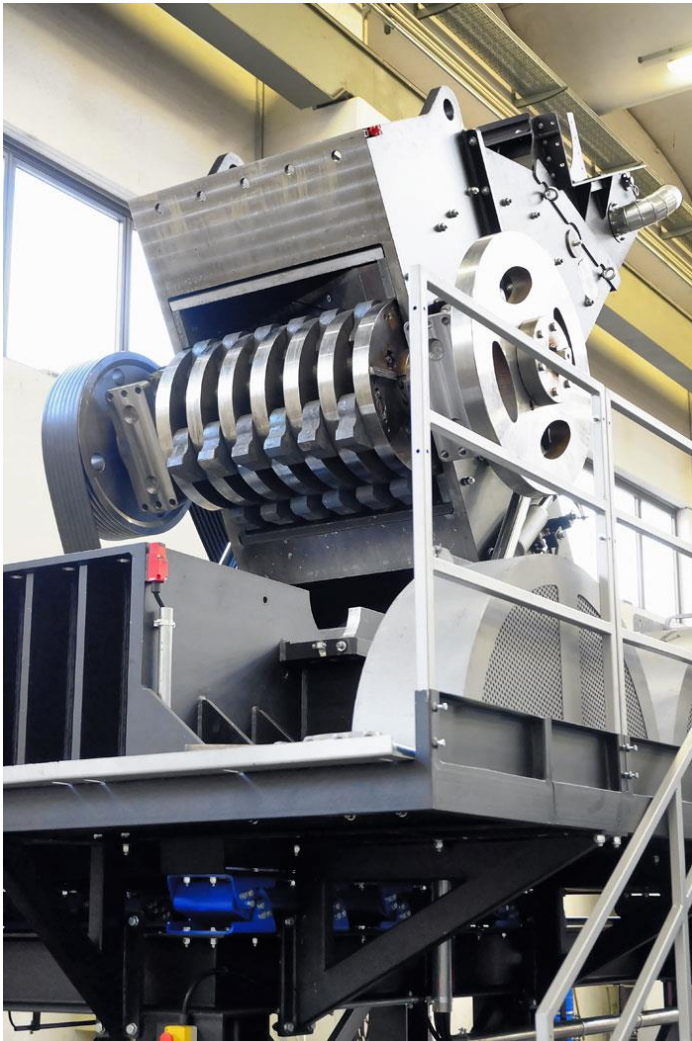
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Mechanical gritting: hammer mill



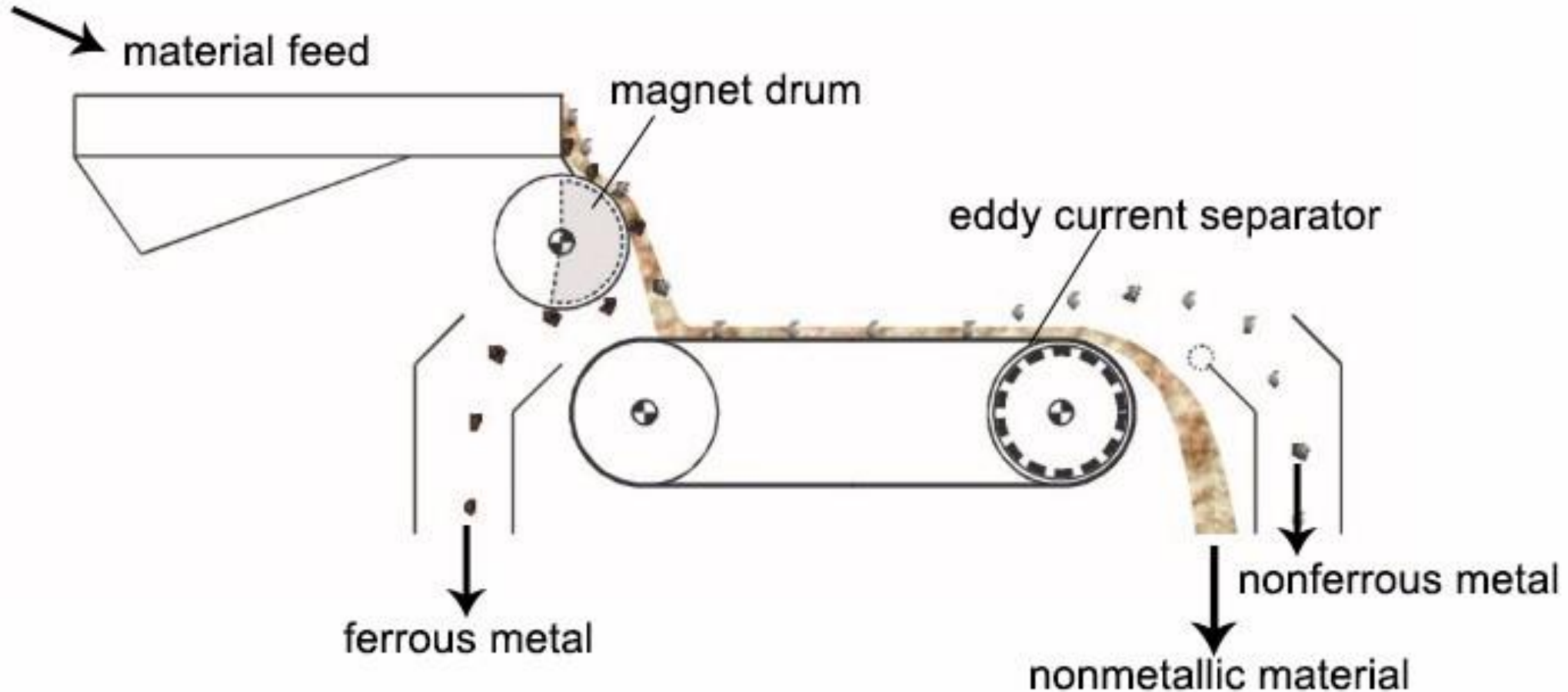
<https://www.forrec.it/prodotti/mulini-a-martelli/z15.html>



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Metal material separator– Induced current



http://www.ejetmagnets.com/sdp/1295090/4/pd-5672852/20362263-2845315/Scrap_zorba_metal_sorting_system.html



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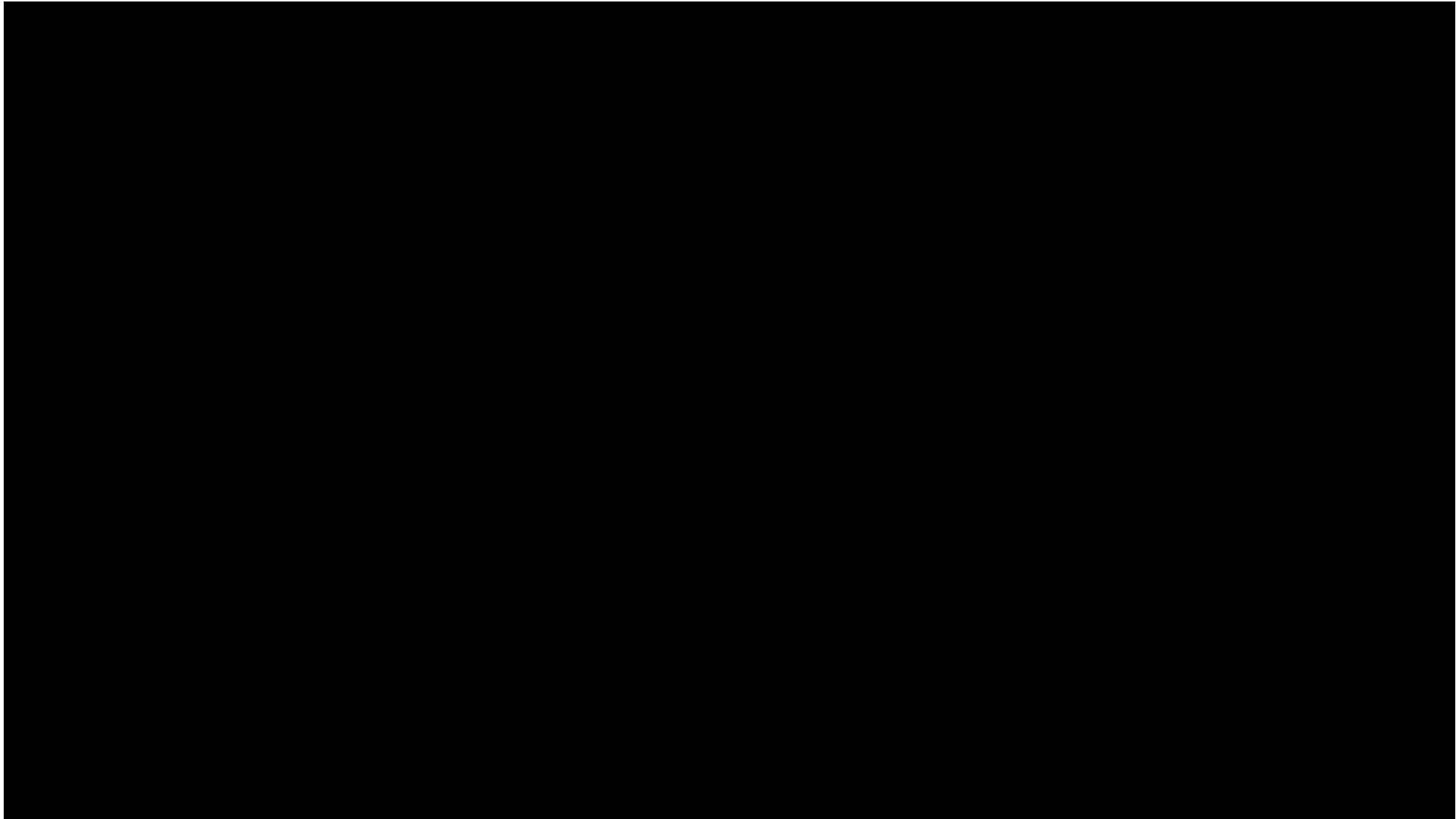
Metal material separator



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<https://ocw.tudelft.nl/course-lectures/2-2-1-pre-processing/>



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2.3 An introduction to metallurgical processes



<https://ocw.tudelft.nl/course-lectures/2-3-1-an-introduction-to-metallurgical-processes/>



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2.4 Metallurgical processes for the recycling of metals



<https://ocw.tudelft.nl/course-lectures/2-3-2-metallurgical-processes-for-the-recycling-of-metals/>



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2.6 Environmental issues (of recycling processes)



<https://ocw.tudelft.nl/course-lectures/2-4-2-environmental-issues/>



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Material recovery from electronic cards

<https://www.youtube.com/watch?v=10gUNPuAqE0>



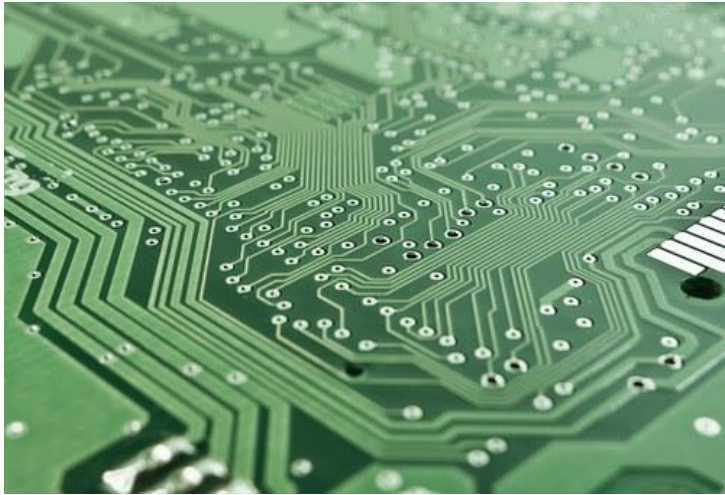
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Printed Circuit Boards (PCBs) and Electronic Boards

A printed circuit board in the electronics is a support used to interconnect the various electronic components between them through conductive tracks etched on a non-conductive material.



<https://www.meccanicanews.com/2017/12/19/esseti-circuiti-stampati/>

<https://www.elettroonline.it/prodotto/578d-780d-schede-elettroniche/>

Generally the material used is a "Fiberglass" plate covered with a thin metallic layer. This layer is subsequently carved with the engraving technique (laser or acid).

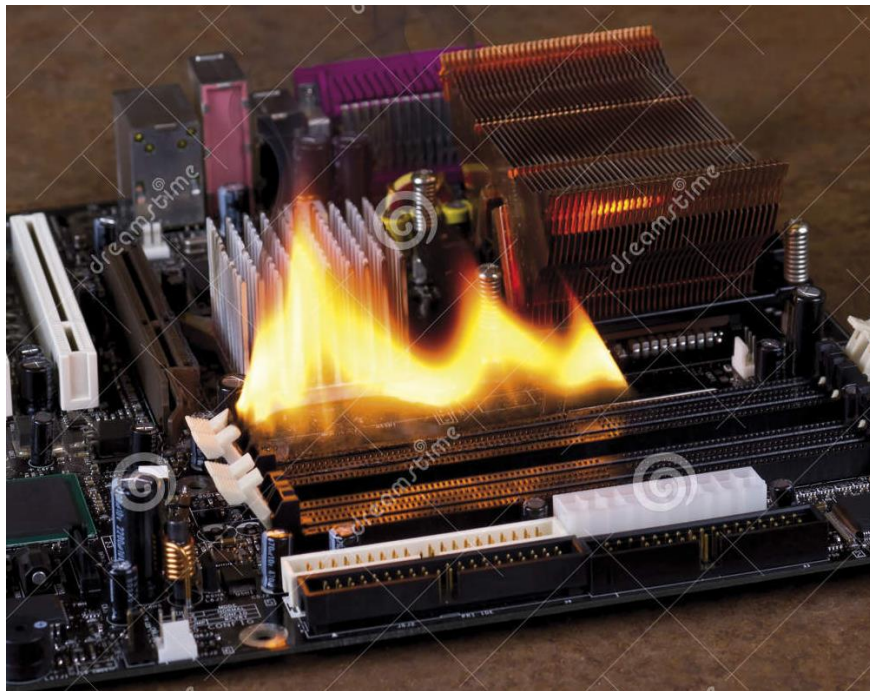


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Material recovery from electronic cards

Issues related to the use of FR in WEEE

The printed circuit is added with flame retardants FR. Compounds that delay or prevent accidental combustion but they release toxic substances when decomposed.



Dioxine e Furans



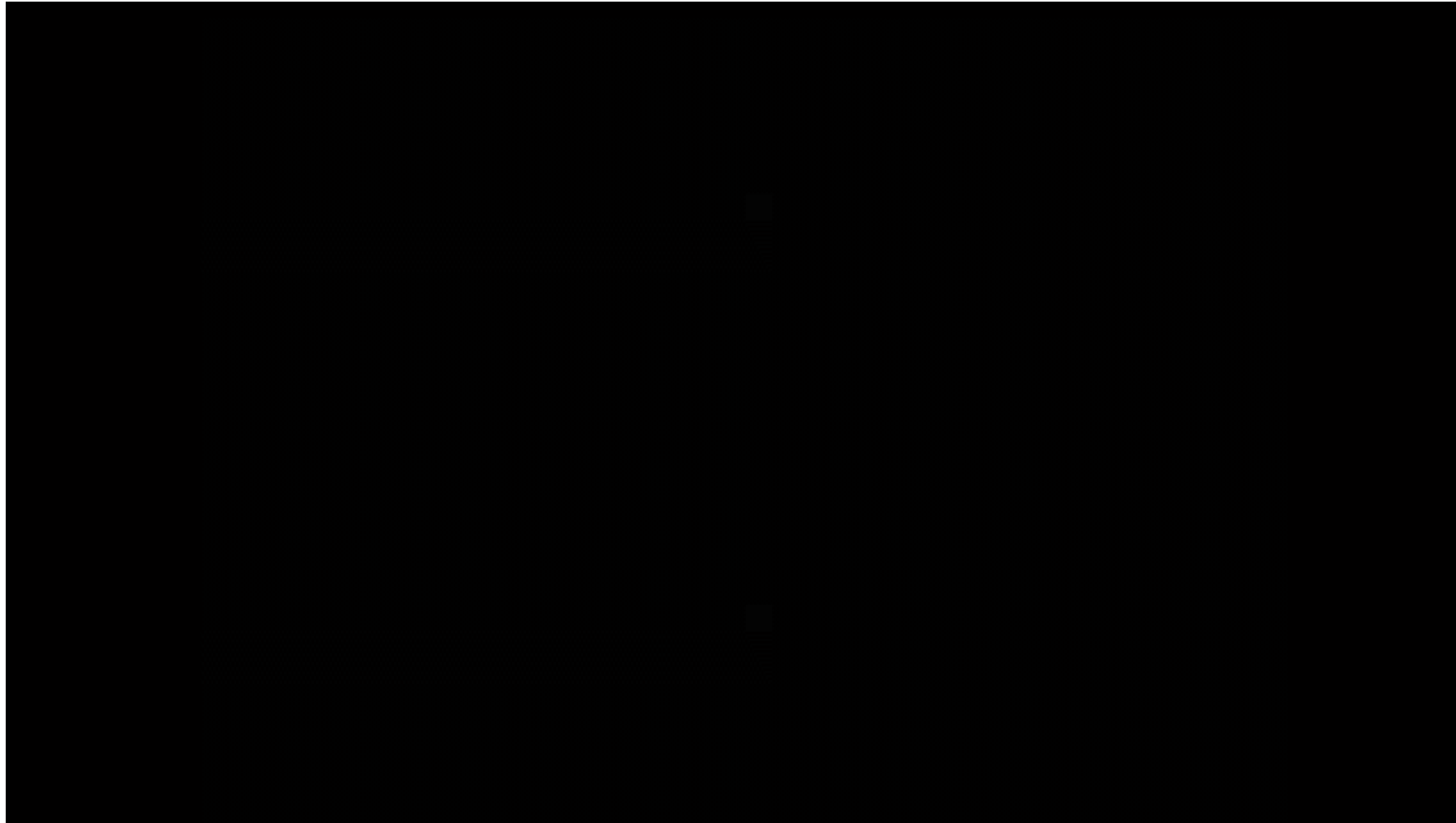
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Material recovery from electronic cards

<https://www.youtube.com/watch?v=10gUNPuAqE0>



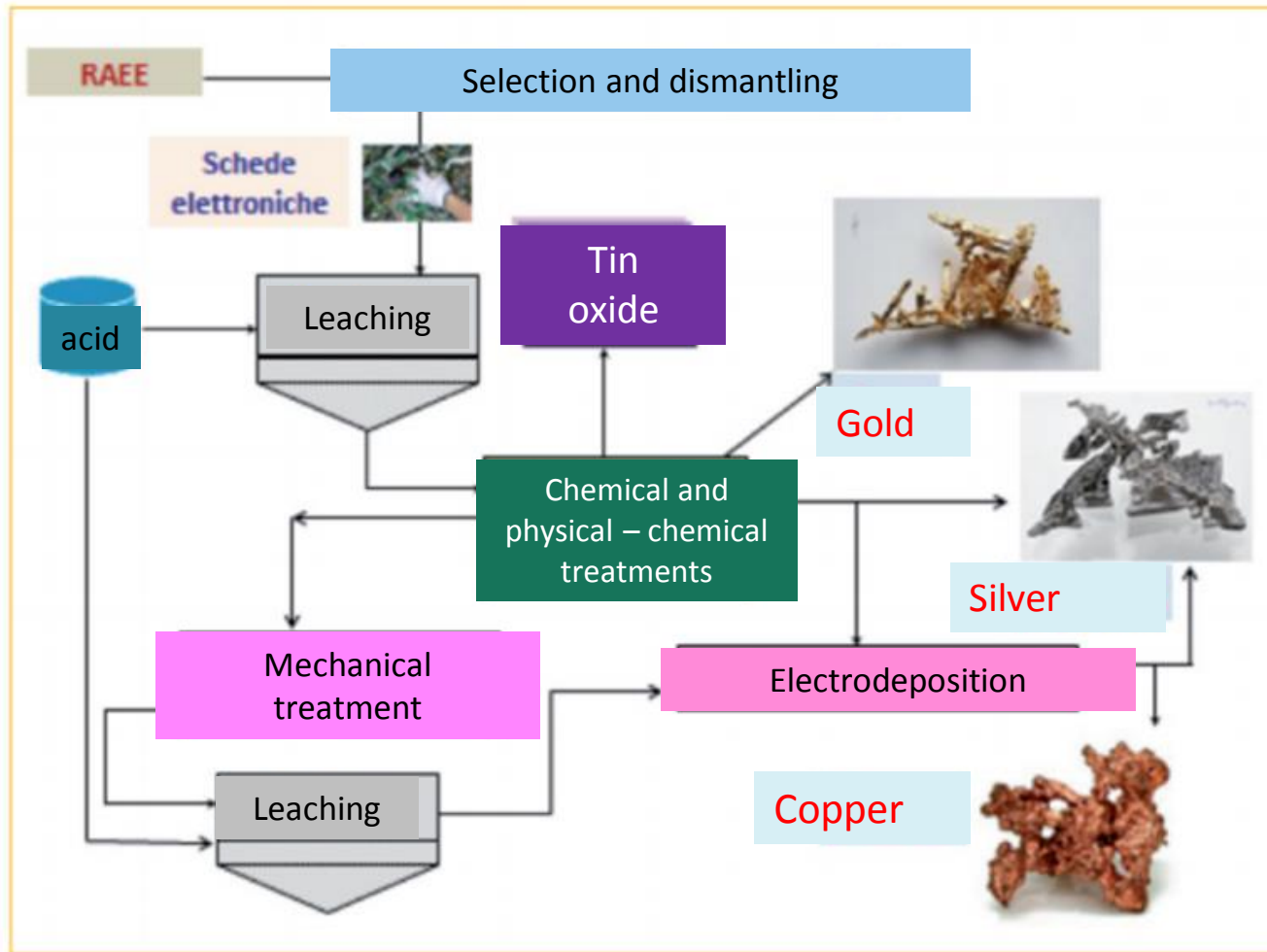
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Recovery of noble metals by hydrometallurgical process



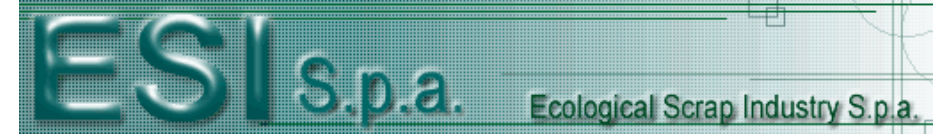
Processo idrometallurgico di recupero di oro, argento, stagno e rame da schede elettroniche

	Quantity recovered per ton of electronic boards	Indicative commercial value (2013 estimate)	Approximate potential value in euro
Electrolytic copper	260 kg	5,30 €/kg	1380
Lead sulfate	40 kg (-29 kg di Pb)	1, 50 €/kg (Pb)	40
Tin	33 kg	17,30 €/kg	570
Gold	140 g*	31,50 €/kg	4410*
Silver	0,66 kg	500 €/kg	330
		Total	6730

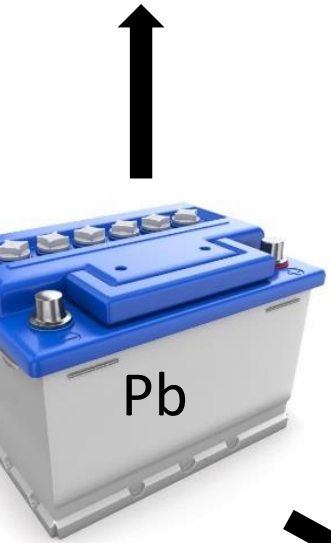
* Amount of gold present in cards without processors: with processor this amount could reach a total value of 280 gr, for a corresponding value of about 8000 euro/ton

<http://www.enea.it/it/segui/publicazioni/pdf-eai/n-5-settembre-ottobre-2013/tecnologie-recupero-raee-sicilia.pdf>

EcoPiombo Project: Pb recovery by hydrometallurgical way



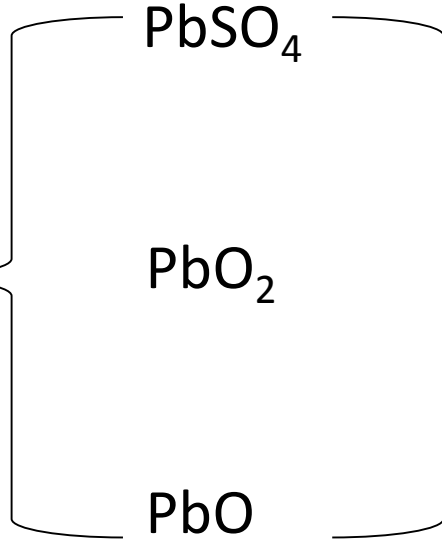
Sulfuric
Acid



Plastics



Pb⁰ Grid



pastel

Pirometallurgic
(1000 °C e coke)

Hydrometallurgic



Pb⁰

Debris of Fe

Urea Acetate



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Recovery of rare earths with hydrometallurgical processes



The CRMs (rare earths) are recovered by treating the fluorescent powders contained in the CRT displays

RELIGHT



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Pilot plant for the recovery of rare earths from fluorescent powders



Production of Y ed Eu
Carbonates



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The 42% of the world consumption of cobalt (100.000 t/anno) is due to the use of Li-batteries



<https://h2020-crocodile.eu/>

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