How to improve recovery of electrical and electronic equipment waste

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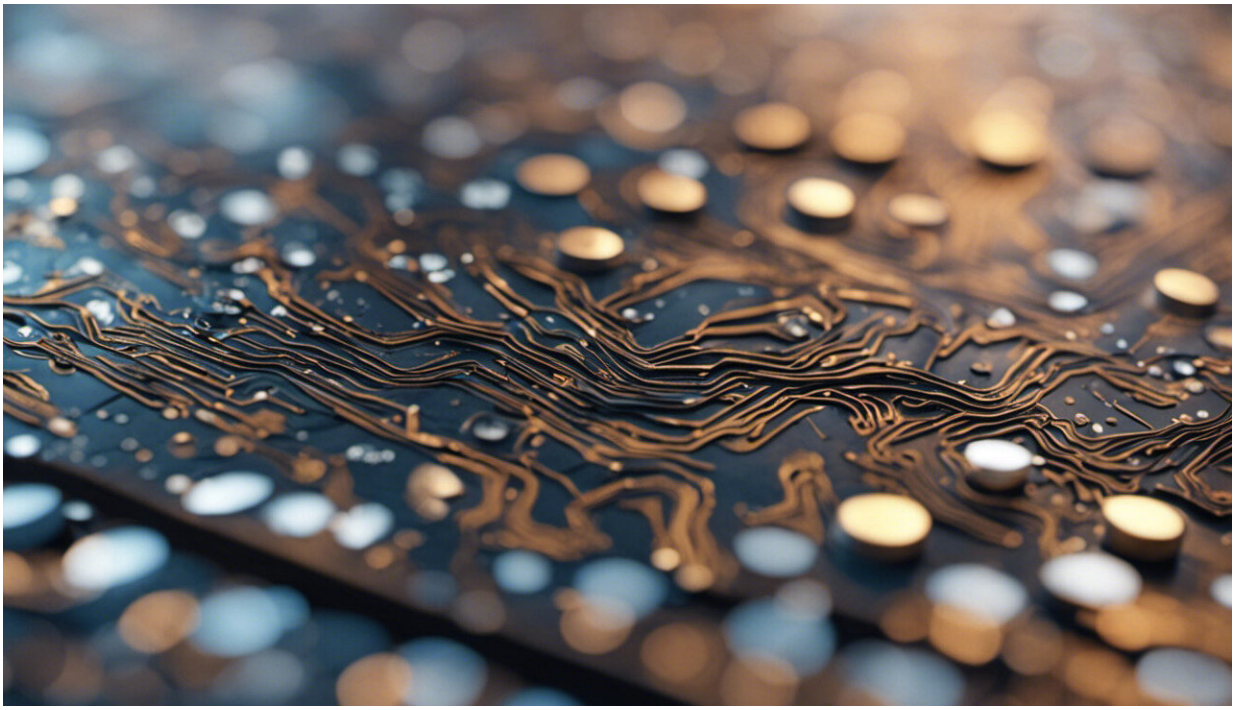

Credit: AI-generated image (disclaimer)

Better recycled critical raw materials will be given a new life thanks to an EU project. This initiative could contribute to a circular economy, promoting the efficient use of scarce and expensive resources.

Processing and recycling waste of electrical and electronic equipment

(WEEE) such as computers, TVs, fridges and mobile phones is more important than ever, considering the rapid growth in consumption of these products. Europe was the region that produced the second largest amount of e-waste in 2016 – with 12.3 million tonnes (MT), after Asia which generated 18.2 MT. Despite the existence of legislation in place, only 8.9 MT of e-waste are documented to be collected and recycled globally. This corresponds to 20 % of all the e-waste generated.

By using new tools and methodologies, the EU-funded CloseWEEE project hopes to improve the collection, treatment and recycling of electronics at the end of their life. As stated on the project website, the main goal of CloseWEEE is "to increase the range and yields of recovered materials from WEEE streams."

It aims to develop and implement robust and cost-efficient recovery technologies, give recycled materials a new life in added-value applications, and provide efficient tools for the localisation and separation of hazardous and valuable materials.

Recycled and given a second life

CloseWEEE recently designed and tested an innovative microwave treatment technology for lithium-ion (Li-ion) battery waste. As part of this technique, "batteries undergo a pre-treatment of discharging and mechanical processing. The Li-ion battery material is then fed into a microwave furnace where the material is heated up rapidly and the organics (electrolytes and separators, etc.) are pyrolysed/evaporated." This leads to the production of "electrolyte-free material for subsequent hydrometallurgical treatment for recovery of metals … [cobalt, nickel, manganese, lithium] and graphite."

The recovery of critical raw materials (CRMs) such as cobalt and graphite is crucial because they are used in the production of a broad

range of goods and applications, including high-tech products and emerging innovations. Material produced from battery recycling, cobalt, for example, can be used for the battery industry or steel and other industries depending on the quality of the recycled material. Graphite, whose recycling is quite limited, is another CRM that is used in various industrial applications, including high-temperature lubricants, steel manufacturing, smartphones and Li-ion batteries.

As explained in a staff working document by the European Commission, a smartphone might contain up to 50 different metals. This makes it lightweight, and its small size user-friendly. CRMs are irreplaceable in solar panels, wind turbines, electric vehicles and energy-efficient lighting. Hence, they are also relevant for fighting climate change.

Now in its final year, the CloseWEEE (Integrated solutions for pre-processing electronic equipment, closing the loop of post-consumer high-grade plastics, and advanced recovery of critical raw materials antimony and graphite) project also contributed to the production of a high-gloss acrylonitrile butadiene styrene compound. This was done using a mixture containing recycled materials from waste small domestic appliances. According to the project website, "the compound is of high quality and suitable for applications in new electronic and electrical equipment." Acrylonitrile butadiene styrene is a specific type of plastic polymer that is commonly used in the 3D printing process.

More information: CloseWEEE project website: closeweee.eu/

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https://phys.org/news/2018-07-recovery-electrical-electronic-equipment.html