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IIT Delhi Researchers Develop Technology To Manage, Recycle E-Waste

The developed technology will cater to the need of "Smart Cities," "Swachh Bharat Abhiyan," and "Atmanirbhar Bharat" initiatives of the Central Government, IIT Delhi said.

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Image credit: IIT Delhi

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New Delhi: A team of Indian Institute of Technology (IIT) Delhi researchers have developed a sustainable technology to manage and recycle e-waste. The project, led by

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Engineering Laboratory at Chemical Engineering Department, IIT Delhi, was funded by the Department of Science and Technology, Government of India. It was further scaled-up under the Delhi Research Implementation and Innovation (DRIIV) initiative.

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IIT Delhi said e-waste is one of the fastest-growing waste streams with an annual growth rate of 3 to 5 per cent. The Global E-waste Monitor Report 2020 says 53.7 million metric tonnes (MMT) of e-waste was generated in 2019 globally, and it is expected to reach 74.7 MMT by 2030.

India is the third-largest producer of e-waste and has generated 3.23 MMT e-waste in 2019 alone, IIT Delhi said.

These e-waste contain toxic materials and unregulated accumulation, landfilling, or inappropriate recycling processes are threats to human health and the environment.

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and energy production.

IIT Delhi's research

The methodology adopted by IIT Delhi researchers is a three-step process – pyrolysis of e-waste, separation of metal fraction, and recovery of individual metals.

Firstly, e-waste is shredded and pyrolyzed to yield liquid and gaseous fuels, leaving behind a metal-rich solid fraction. On further separation, the leftover solid residue yields a 90-95 per cent pure metal mixture and some carbonaceous materials.

The carbonaceous material is further converted to aerogel for oil spillage cleaning, dye removal, carbon dioxide capture, and use in supercapacitors.

In the next step, a low-temperature roasting technique is employed to recover individual metals such as copper, nickel, lead, zinc, silver and gold from the metal mixture.

It gives a recovery of nearly 93 per cent copper, 100 per cent nickel, 100 per cent zinc, 100 per cent lead and 50 per cent gold and silver. It is a green process in which no toxic chemicals are released into the environment, IIT Delhi said.

For their project, titled 'Self- Sustainable E-waste Recycling: Generating Wealth from Waste via Zero Discharge Technology', the IIT Delhi team was awarded the SRISTI-GYTI (Gandhian Young Technological Innovation) Appreciation in 2020.

The technology has also been patented and published in i journals like the Journal of Cleaner Production, Journal of Hazardous Materials, Waste Management and the Journal of Environmental Chemical Engineering.

said, "Electronic waste (e-waste) generation is inevitable and if the problem is not addressed now, it will lead to mountains of solid waste sooner or later. The technology pioneered by our research group is an integrated approach that will provide an environment-friendly solution to treat e-waste with the added advantage of metal recovery and fuel production…."

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