

Recycling of Electronic Wastes: Current Perspectives

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Production and use of electrical and electronic equipment, such as TV sets, computers, mobile phones and many other daily-life items, are dramatically increasing over years, while the lifespan of many products becomes shorter—for instance for CPUs from 4–6 years in 1997 to 2 years in 2005. It is estimated that 20–50 million metric tons of electronic wastes per year are generated worldwide. For example, in the United States, it was estimated that over 500 million computers between 1997 and 2007 became obsolete, and only 20% of them were collected, treated and recycled. The electronic waste scrap represents a complex mixture of three major material fractions: metals, polymers, and ceramics. The metal fraction including iron, copper, aluminum, gold and others in electronic wastes is over 60%, while pollutants comprise 2.70%. Approximately 1 billion personal computers have been retired in the United States. These wastes contain more than 1.814 billion kg of plastics, 0.454 billion kg of lead, 0.862 million kg of cadmium, 0.544 million kg of chromium, and 181,437 kg of mercury. Not surprisingly, electronic wastes today constitute 2–5% of municipal solid wastes and they are growing 2–3 times faster than any other components in mu-

nicipal solid wastes. These numbers should attract our attention by the following points:

- Need for recycling: Recycling of electronic wastes is necessary and even vital to our society because of their quickly increasing volume.
- New potential energy source and renewable materials: The large amount of plastics, with main component of carbon and hydrogen, in electronic waste are a potential energy source.
- Economic motivation for recycling: The fact that electronics contain precious metals is a major economic driver for recycling. For example, printed circuit boards contain precious metals like 0.06% Ag, 0.023% Au and 0.01 Pt.
- Environmental issues: Special attention should be paid to toxic components in the electronic wastes during the recycling process, such as polycarbonate materials, bromine and chlorine, and heavy metals like lead, cadmium and mercury.

In this *JOM* topic, six papers are included. In “E-waste and the Digital Transition: Results from a Survey of U.S. Households,” Jean-Daniel

Saphores and Natalia Milovantseva discuss the willingness to recycle electronic waste, based on a national survey of U.S. households.

“Recycling of Lead Solder Dross, Generated from PCB Manufacturing,” is reviewed by Biserka Lucheva et al.

Aleksandar Mitrasinovic et al. discuss “Recovery of Cu and Valuable Metals from E-waste Using Thermal Plasma Treatment.”

Manis K. Jha et al. and Alex Luyima et al. performed experimental work on the leaching of metals from waste printed circuit boards. Jha’s paper discusses “Pressure Leaching of Metals from Waste Printed Circuit Boards using Sulfuric Acid,” while Luyima’s covers “Leaching Studies for Metals Recovery from Waste Printed Wiring Boards.” Luyima et al. also offer a “Kinetic Analysis of the Thermal Degradation of Printed Wiring Boards.” Finally, Wang and Chen discussed the “Recycling of Electronic Control Units from End-of-Life Vehicles in China” and compared it with that in the U.S., Japan, and EU.

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