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Urban mining by flash Joule heating

Bing Deng, Duy Xuan Luong, Zhe Wang, Carter Kittrell, Emily A. McHugh, James R. Tour 1,2,3,4

precious metal recovery from electronic waste, termed urban mining, is important for circular economy. Present methods for urban mining, mainly smelting and leaching, suffer from lengthy purification processes and negative environmental impacts. Here, a solvent-free and sustainable process by flash Joule heating is disclosed to recover precious metals and remove hazardous heavy metals in electronic waste within one second. The sample temperature ramps up to 3400 K in 100 μs by waste-based electrical thermal process. Such a high temperature enables the evaporative separation of precious metals from the supporting matrices, with one recovery yields >80% for Au, Pt, Ag, and 200% for Au, the heavy metals in electronic wastes, of which are for high recovery including Cr, As, Cu, Pb, and Ni, and are removed, leaving a final waste with negligible metal content, acceptable even for agriculture use. Leveled urban mining by flash Joule heating would be six times less energy consumption than using traditional smelting furnaces for metal-component recovery and more environmentally friendly.