Platinum - NurdRage

Distil solvent off until dry. Scrape out solids, and transfer to crucible. Incinerate solids at red heat, until no more vapour is produced. Stir if necessary to ensure all solids are completely burned. Recommended to use porcelain or iron, since nickel oxidises at high temperatures. Transfer incinerate to 5-10x its volume of water. Boil until homogeneous, then filter the solids off. Repeat the process for a total of 5 times. *Optional, only necessary for very large quantities of material: Add the platinum concentrate to hydrochloric acid in a ratio of 2.5g to 50 mL of 31% acid. Boil and stir mixture for 30 minutes.* Add platinum concentrate to hydrochloric acid (37%) at a ratio of at least 4 mL per gram of concentrate. Add 1 mL nitric acid (70%) for every 3 mL hydrochloric acid. Heat to ~95°C with stirring until reaction has ceased. Filter solution, and wash solid reside, and repeat process until stannous chloride shows no more metals dissolving. The final solid residue can be incinerated and run through the process again. It should be mostly carbon. Distil filtrate to ~10 mL, then add 50 mL hydrochloric acid and redistill until filtrate is colourless. For every gram of material that was dissolved by aqua regia, add an equal quantity of sodium chloride to the residue from the distillation. Boil solution until dry. Add 20 mL of water and 2 g of sodium bicarbonate to the residue for every gram of material dissolved. Heat and stir to initiate reaction. This step removes base metals. Filter precipitate off and wash. If the original waste did not contain any other noble metals, the platinum can now be precipitated with hydrazine or sodium metabisulphite. To separate palladium, add 3 mL of saturated ammonium chloride solution per gram of metal dissolved (0.6 g per 1 g of platinum). Ammonium hexachloroplatinate can now be filtered off; the hexachloropalladate salt is unstable. Wash the precipitate with a 1% solution of ammonium chloride, ethanol, and diethyl ether. The filtrate can be retreated with ammonium chloride if necessary. The resulting ammonium hexachloroplatinate can then be thermally decomposed to the metal.

Gallium - NurdRage

(separation from aluminium)
Dissolve the metal waste in hydrochloric acid, or otherwise render the waste into a chloride solution. Chill solution to prevent evaporative losses with ether. Extract each 500 mL of waste chloride solution with an equal volume of diethyl ether. Repeat the extraction two or three times, then distil off the ether. Add to the residue twice its volume of water, then distil the remaining ether off. Add sodium hydroxide to the aqueous residue in portions of 5% of the solution mass. Filter any the precipitate off, then electrolyse the solution with a platinum or nickel anode and a titanium (or copper, nickel, steel, or any alkaline-stable) cathode. Pass just enough current for the cathode to just start to bubble. Heat the solution to ~40°C to liquify the gallium formed.

Mercury(II) – NileRed

Waste neutralised to pH 7 with sodium bicarbonate, then excess added to achieve a buffer solution at ~pH 8. Sodium sulphide solution (20%) added until no more precipitation occurs. If too much sodium sulphide is added, a water-soluble complex is formed, but only occurs at high concentrations and pH. The precipitate is allowed to settle, and the upper liquid decanted through a celite filter. The precipitate is washed with warm water, and dried on the filter. The filtrate was tested for mercury, then treated by adding chlorine tablets (bleach) to destroy the residual sulphides. The filtrate waste is now safe to dispose of domestically.