

## Microwave-assisted leaching of five representative metals from spent lithium-ion batteries

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Recovery of industrial metals including Co, Li, Cu, Ni, Zn, Mn and Al from spent lithium-ion batteries (LIBs) is beneficial considering their limited reserves. In this work, the leaching efficiencies of five representative metals, i.e., Co, Li, Cu, Ni, and Mn, from spent LIBs were studied. Effects of particle size, temperature, solid-liquid ratio and leachate concentration on the leaching efficiencies were investigated under microwave irradiation. The optimum leaching conditions were found to be 2 M H<sub>2</sub>SO<sub>4</sub> with 5 vol% H<sub>2</sub>SO<sub>2</sub>, 180 °C heating by microwave and LIBs with particle size in the range of 106–150 μm. Under these conditions, it was confirmed that the metals were completely leached out within 1 hr. It is interesting to note that leaching under microwave irradiation was possible even in diluted H<sub>2</sub>SO<sub>4</sub> e.g., 0.5 M and 0.1 M. Here, we report that microwave-assisted leaching contributes to improving the leaching efficiencies of the metals from spent LIBs in terms of both leaching rates and amounts.