

Let's recycle using vinegar

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Acceptable : 8
Period : 2 Semester
Meeting date : 4:20 PM, 1 October (Wed.)
Meeting place: Aoba-yama Campus, Rare-metal
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In our daily lives, a wide variety of electronic waste is constantly generated, causing environmental destruction and pollution. These electronic wastes often contain high-value metal elements. Therefore, if it becomes possible to recycle valuable metals while treating electronic waste, it would not only reduce environmental pollution but also offer significant economic benefits. However, traditional metal recovery methods often use inorganic acids such as sulfuric acid and hydrochloric acid. Although these acids can achieve high recovery efficiency, they also cause serious problems of acid corrosion and acid-related pollution. In particular, elements such as sulfur and chlorine contained in these acids are highly destructive to the environment.

In recent years, our group proposed replacing inorganic acids with organic acids. When the temperature exceeds 90 °C and under certain pressure, organic acids exhibit faster and more efficient leaching ability compared to inorganic acids. This process is referred to as 'hydrothermal leaching using organic acids'. It was found that organic acids such as citric acid, acetic acid, and amino acids can serve as effective leaching agents. When using these organic acids, there is no need to add reducing agents or other accelerants during the leaching process. Moreover, after separating the metal elements from the leachate, the final waste solution does not require special post-treatment upon discharge. Therefore, compared to inorganic acids, the hydrothermal leaching process using organic acids has significant advantages in terms of environmental friendliness.

Vinegar is a natural organic acid solution containing mainly acetic acid. We have used various types of vinegar to extract metal from the cathode material of lithium-ion batteries using an organic acid hydrothermal leaching method, and found that the type of vinegar used affects the type of metal extracted. In this training session, we will investigate how effective commercially available vinegars are as leaching agents.