Suggestions on the rare metals recycling system based on a consideration on combination of contained metals in wasted small home electric equipments

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1. Backgrounds and Purpose

Rare metals are called "Vitamins for Industry" and we cannot manage our environmentally – friendly society without them. Since they have limited localities on the Earth, we have difficulties to get specific metals. Recently, we are careful for small home electric equipments like cellphone because of their high density of rare metals as they're claimed to be collected and recycled. But there is no regulation for recycling them, so great many of them are wasted now. Many researchers have been studied on containing metals in small home electric equipments, but lack of research on combinations of containing metals for scheme designing. This study analyzed contained metals of used equipments numerically and tried to find useful recommendations on the proper collection and recycling system.

2. Results and discussion

(1)Clustering analyses on the contained metals

Firstly, clustering analysis was conducted on contained metals in small equipments data without any categorizing. The result showed the content rate of basic metals such as Iron and Copper mainly, but it doesn't classify groups by percentages of rare metals because of their low concentration. It's not suitable for structuring recycling systems for rare metals. Secondly, chosen metals combination of the parts in equipments and national strategic materials was analyzed by clustering. The results from these analyses reflected content rates of rare metals. Especially, the results of categorized by metals contained in certain parts can find fruitful resources of specific metals. (Fig.1)

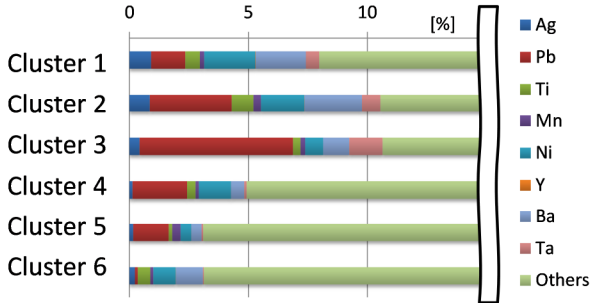

Figure 1 Average composition of clusters classified by the group of contained in Capacitor

(2) Principal components analyses on the metals

Principal components analyses were done on the certain metals combinations. Principal components scores were plotted by first and second components. Results indicate that which equipments have potential for getting certain combinations of rare metals. (Fig.2)

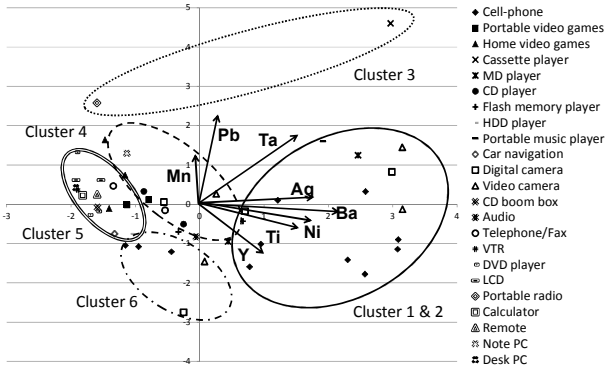

Figure 2 Plot by first & second principal components score classified by the group of contained in Capacitor with the result of clustering

3. Conclusion

As a conclusion, conducted methods in this study are useful to identify equipments which are desirable to collect certain combinations of rare metals. Results have potentials to be applied in designing collection system for wasted small home equipments to get specific metals strategically.