Simultaneous fluorination and oxidation of iridium by metal tetra-fluorobromates

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Scientific and industrial interest in the problem of extraction and separation of valuable components from municipal solid wastes, the so called “urban mining”, [1] is steadily growing. Such components are mainly expensive metals of lower availability, such as the noble, or the rare earth metals. These are usually included in different parts of electronic devices and supplies and are present in quite low percentage. Although a lot of investigations were carried out in order to solve the problem of re-obtaining these resources, a universal solution has not been found yet.

One of the directions, where a possible solution can be developed, is simultaneous treatment of all noble metal compounds in urban solid wastes in order to turn them to complex fluorides. This method is more convenient in comparison to 56luontial techniques for homogenization of materials mainly due to the fact that there are no liquid wastes formed on the first stage of the process. However, a question of choosing an effective and convenient fluorinating agent arises in this case. In this study we analyzed the possibility of using a relatively uninvestigated class of chemical compounds – the tetrafluorobromates of alkali and alkaline-earth metals [2] – for the extraction and successive separation of noble metals. Results of X-ray powder diffraction analyses of the products formed in the reactions of various tetrafluorobromates and iridium metal were obtained. Also, results of thermogravimetric and differential thermal analyses were studied to get a deeper understanding of the processes involved.

It was shown that the main product of such interaction was a corresponding metal hexafluoroiridate(IV) $\text{Me}_2\text{IrF}_6$. Besides that compound, there were found either some residual amount of metal fluorobromate(III) in case it was taken in excess, or some amount of iridium metal and a number of unidentified products in case there was lack of a fluorobromate(III).

References: