

Technical possibilities to support separation of radioactive elements from metallic waste

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Abstract

In the nuclear industry metallic objects can be either surface or bulk contaminated. Surface contaminated objects are often decontaminated by chemical or mechanical means, but are there other possibilities?

During melting slags are formed either spontaneously or by adding slag forming compounds. However, one question that frequently arises is:

Can all nuclides be separated by adding slag forming compounds?

This question is not entirely correct as it is not only the radioactive nuclides that are separated from the metal but all atoms of that element present in the melt, radioactive and stable isotopes alike.

Part of the answer lays in thermodynamics. Thermodynamics cannot positively answer the question with yes, as there are also practical and economical aspects to take into account, but if the answer is no there will never be any practical or economical efforts that will override nature.

This paper will describe the theoretical baseline for evaluating the possibilities to separate certain elements during the melting process, mainly from steel but other metals will also be touched on. The most common elements that have radioactive isotopes of interest is of course cobalt (Co-60, Co-58), but other elements of interest are manganese (Mn-54), strontium (Sr-90), antimony (Sb-125) and of course heavy elements such as uranium, plutonium and americium.

The paper will also describe methods used in the normal metal melting industry to separate elements from the base metal melted. This section will cover practical methods used as well as developed methods that are very seldom used due to time or financial constraints.