

## Abstract

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### **Hydrometallurgical methods for production of nickel(II) and cobalt(II) perrhenates – semi-products for manufacture of Re-Ni, Re-Co alloy powders**

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## Abstract

The paper presents modern technologies for production of nickel(II) and cobalt(II) perrhenates which are then used in manufacture of Re-Ni, Re-Co powder alloys. The innovative idea behind application of such compounds for production of Re-Ni, Re-Co powder alloys is to provide a possibility for introduction of two components of superalloys, i.e. rhenium and nickel/cobalt in a form of one compound. In that way milling of individual compounds (e.g. metallic Ni with  $\text{NH}_4\text{ReO}_4$ ) during preparation of the charge for reduction can be skipped and the melting point of the material generated from such a powder becomes reduced. The technologies are characterized by high effectiveness and very good waste management potential, therefore they can be classified as highly environmentally friendly. Currently there are two pilot installations of the developed technologies operating in the Institute of Non-Ferrous Metals in Gliwice, each of annual capacity of 20-50 kg. Both nickel(II) and cobalt(II) perrhenates of high purity are produced there, by sorption of nickel/cobalt from acidic sulfate or nitrate solutions and then by elution of the sorbed metals (Ni or Co) with aqueous solution of perrhenic acid, which is also produced by ion-exchange method. The rhenium and nickel/cobalt containing solutions from elution are sent for concentration. In the result of the concentration residues of nickel(II) or cobalt(II) perrhenates are generated. After drying, anhydrous perrhenates of the selected metals are produced, which contain up to 66.6% Re and 10.5% Ni, and up to 66.6% Re and 10.5% Co, in nickel(II) perrhenate and in cobalt(II) perrhenate, respectively, and up to 100 ppm of metallic impurities in both products. The waste solutions which are generated in the process are either recycled or the metal value is recovered from them by widely known methods. The studies showed that the produced compounds are good substrates for production of homogenous Re-Ni, Re-Co alloy powders. Both technologies were developed in cooperation of Institute of Non-Ferrous Metals in Gliwice with KGHM „Ecoren” S.A. company – the leading rhenium manufacturer in Europe – within the scope of EU ProMine project.

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