

**RHENIUM IN NON-TRADITIONAL RAW MATERIALS:
DETERMINATION, DISTRIBUTION, PROCESSING**

A.M. Chekmarev, I.D. Troshkina

D. Mendeleev University of Chemical Technology, Moscow, Russia

Rhenium is obtained as by-product in the processing of concentrates from molybdenite and copper ores. Limited resources of traditional raw materials are responsible for the searching of new sources of rhenium.

The organophilic properties of rhenium are the cause of its concentration in the natural organic substances. Carbonaceous source, which is represented by a large group of minerals, such as oil, bitumen, carbon, oil shale, is a non-traditional potential raw material of rhenium. Since the deposits of these minerals run into milliards of tons, the rhenium resources in them are great, in spite of the relatively low rhenium concentration. Data on rhenium content in carbonaceous raw materials are relatively scarce and contradictory, although all of them considerably exceed its abundance ratio in the crust ($7 \cdot 10^{-4}$ g/t by A.P. Winogradov).

The rhenium determination in carbonaceous raw materials and products of their processing is performed by using high-sensitivity methods of analysis – mass-spectrometric, gamma-activated, kinetic (with sample preparation before analysis). Losses and their distribution at operations of sample preparation depending on reagent mix for caking were estimated by the radiotracer method of analysis with using of radiotracer ^{188}Re . Expressive radiometric correction method with substoichiometric separation of rhenium was used for rhenium determination in solutions contained more 1 mg Re/dm³.

Rhenium distribution at high temperature combined processing of some kinds of carbon-containing raw materials: oil shale (OS), shungite-containing rocks (SH), high-viscosity oil (OL) and native bitumen (BI) was studied. The products of rhenium concentration are found.

It is established that during semicoking of oil shale, rhenium is concentrated in a semicoke; during bertinization and oxidizing pyrolysis – in bertinate pyrolysis coke and coke correspondingly.

Rhenium distribution in man-caused products during shungite concrete production from shungite-bearing rocks in Karelia (carbon content less than 3 %) is studied. Rhenium increased content is found in dry cleaned dusts of waste gases. Using shungite rocks with carbon content between 25-30% as charge material for cast iron melting showed absence of rhenium in man-caused products of blast furnace practice. Blast furnace dust, which is

forming during periodical high temperature cleaning of blast furnace, can be possible rhenium concentrator.

Rhenium distribution in products of fractional distillation of some metalliferous oils and native bitumen of Tatarstan is studied. It is established that 85-96% of rhenium is concentrated in the residual fraction. Condition of rhenium concentration in deasphalting of oil and its residual distillation fraction are found. Rhenium was mostly concentrated, when deasphalting of the initial oil extracted by heat action at the solvent : OL ratio equal to 3:1 was carried out.

Hydrometallurgical methods of rhenium recovery and concentration with separation from other metals in the combined processing of some types of carbonaceous sources are developed.

The rhenium distribution in products of complex processing of sulfide copper raw materials is studied. The rhenium content in intermediate products and wastes – spent washing sulfuric acid, effluents, recycled water, overflow from thickeners is determined.

Sorption and ultra-filtration of rhenium microquantity are investigated.

Basic flow-sheets have been developed and successfully tested using actual available products as unconventional raw materials for rhenium recovery.