CONCENTRATION OF valuable METALS BY MICROwave DISCHARGE IN LIQUID HEAVY OIL PROCESSING PRODUCTS

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Recently a new method of using microwave plasma has been developed, in which plasma is created in the bulk of liquids [1]. Although the method is relatively new (the first papers appeared about 15 years ago), it has already successfully proved in solving various applied problems, such as generation hydrogen, nanopowders, etc.

The present work continues the cycle of studies of microwave discharges in liquid hydrocarbons [2]. It describes the results of experiments on the separation of metals from the liquid residue of vacuum distillation of the product of hydroconversion of tar during the creation of a microwave discharge in its volume. It is shown for the first time that the content of metals Al, Co, Cu, Fe, Mo, Ni, V, Zn in the tree structure deposited on the microwave antenna is 10-20 times higher than their content in the initial substance. The discharge system is described in [2]. The experiments were carried out at a microwave power of the order of 500 W.

The object of investigation is the residue of vacuum distillation of the product of hydroconversion of tar. It has a density of 1095 kg / m3 and consists of approximately 86% carbon and 10% hydrogen, and the remaining 4% is in sulfur, nitrogen, oxygen. There are also trace amounts of Al, Co, Cu, Fe, Mo, Ni, V, Zn. The investigated object is of particular interest for study, since it is a product of the process of concentrating valuable metals contained in heavy oils, heavy residues of oil refining, spent catalysts [3], and the use of plasma methods can lead to an additional concentration of metals, which may prove economically and technologically expedient.

The viscosity of the object is high, so a mixture of 70% of the hydroconversion product and 30% of the solvent "Nefras C2 80/120" was used in the experiments. In addition, the substance to be treated was poured into the reactor in the preheated state (~ 80 ° C), and then the substance was heated by the action of plasma and microwave radiation. Analysis of the results shows that content of metals in the soot (one of the process product) is much less than in the initial sample. The content of metals in the treated product does not change after treatment. At the same time, the content of metals in the material deposited on the antenna is much larger than in the initial material and the degree of enrichment for different metals is in the range of 10-20 times. Note that the content of aluminum and copper in the processed and unprocessed product is almost the same. This may indicate that the portion of these metals that can come from the material of the camera and the antenna is negligible.

The novelty of the proposed method of metals concentration is protected by the patent [4].

References.

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