

40) Russian Journal of Non-Ferrous Metals

Volume 60, Issue 2, 1 March 2019, Pages 118-124

Utilization of Industrial Liquid-Waste Effluents of the Titanium–Magnesium Production(Article)

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Краткое описание Просмотров пристатейных ссылок (22)

**Abstract:** The results of studying the utilization of waste effluents of a metallurgical enterprise using centrifugation and vacuum-sublimation methods are presented. The objects of study are industrial effluents of titanium–magnesium production. The influence of the centrifuge rotation speed, duration, temperature, and solid content on the separation of industrial effluents into liquid (centrate) and solid (sediment) phases is studied. A complex of studies based on using the multifactorial experimental design procedure is performed to evaluate the influence of each factor. It is established that the optimal centrifugation parameters are a rotor speed of 3000 rpm and a duration of 30 min. The centrate contains suspended substances in an amount of 195 mg/dm<sup>3</sup>, chlorides in an amount of 26 500 mg/dm<sup>3</sup>, and dry residue in an amount of 39 750 mg/dm<sup>3</sup>—evidencing its high mineralization and need for the further purification. The reasonability of using the thermal method of centrate demineralization using a rotary vacuum evaporator is shown in laboratory conditions. Optimal process parameters are  $t = 70^{\circ}\text{C}$ ,  $P_{\text{res}} < 50$  mbar, and  $\tau = 30$  min. The residue yield after the vacuum sublimation is 6% of the centrate weight. No suspended substances are found in the condensate, and the chloride content was 50 mg/dm<sup>3</sup>. The proposed utilization technology of industrial effluents of the titanium–magnesium production will promote the development of a closed water-supply cycle at the enterprise. The residue after the vacuum sublimation of the centrate, which contains mainly alkali metal and alkali-earth metal chlorides, can be recommended as an additive for the preparation of anti-ice materials as well as drilling fluids for well mud solutions. © 2019, Allerton Press, Inc.