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CONTENTS

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OPTIMIZATION OF MINERAL EXTRACTION PROCESS BY CONTROLLING OF REAGENT SUPPLY INTENSITY

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In the present work optimization of in-situ leach mineral mining process is considered. Preliminary performed numerical calculations show that recovery degree of layer strongly depends on the input reagent concentration and the arrangement of wells at the in-situ leaching (ISL) of minerals. Therefore, solution of optimization problem of mineral leaching process is reduced to solve two problems, one of which is a problem of optimal control the intensity of reagent supply, and another - optimal arrangement of wells. The process of mineral extraction by the ISL method is described by the equations of mineral dissolution, transport liquid solution and dissolved minerals, on condition that the distribution of mineral in the reservoir is known and concentration of solution and dissolved useful element doesnt exist at initial time. During the leaching, when the arrangement of wells is already known, current process in layer can be controlled only by the input concentration of reagent on the injection well. Therefore, reagent concentration is taken as a control in the considering problem. Control of reagent concentration value on the injection well leads to the changing of mineral value in liquid phase. On the value of input reagent concentration imposed two constraints: 1) in the inequality form (inequality constraint) constraining amount of reagent concentration on each injection well, 2) an equality of the total reagent concentration to all wells to a definite value at each time station. Computational program for calculation of optimization problem is elaborated. Based on received results influence of reagent supply on excavation rate, mining efficiency and time of deposit excavation has been investigated and optimal value of reagent concentration on injection well is obtained.

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