

## Removal of Nickel and Vanadium from Crude Oil by Using Solvent Extraction and Electrochemical Process

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**Abstract :** Last decades crude oils have tended to become more challenge to process due to increasing amounts of sour and heavy crude oils. Some crude oils contain high vanadium and nickel content, for example Pavlodar LLP crude oil, which contains more than 23.09 g/t nickel and 58.59 g/t vanadium. In this study, we used two types of metal removing methods such as solvent extraction and electrochemical. The present research is conducted for comparative analysis of the deasphalting with organic solvents (cyclohexane, carbon tetrachloride, chloroform) and electrochemical method. Applying the cyclic voltametric analysis (CVA) and Inductively coupled plasma mass spectrometry (ICP MS), these mentioned types of metal extraction methods were compared in this paper. Maximum efficiency of deasphalting, with cyclohexane as the solvent, in Soxhlet extractor was 66.4% for nickel and 51.2% for vanadium content from crude oil. Percentage of Ni extraction reached maximum of approximately 55% by using the electrochemical method in electrolysis cell, which was developed for this research and consists of three sections: oil and protonating agent (EtOH) solution between two conducting membranes which divides it from two capsules of 10% sulfuric acid and two graphite electrodes which cover all three parts in electrical circuit. Ions of metals pass through membranes and remain in acid solutions. The best result was obtained in 60 minutes with ethanol to oil ratio 25% to 75% respectively, current fits into the range from 0.3A to 0.4A, voltage changed from 12.8V to 17.3V.

**Keywords :** demetallization, deasphalting, electrochemical removal, heavy metals, petroleum engineering, solvent extraction

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