According to the results of the tests, only the sample number 2 meets the requirements of USS 305-2013 "Diesel fuel. Technical Specifications" [7] for all properties that have been investigated, and can be used as commercial diesel fuel.

References

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NICKEL COATINGS OBTAINED FROM NON-AQUEOUS ELECTROLYTES FOR HIGHLY SOLUBLE PCMS

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In last decade a significant interest in the application of phase change materials (PCMs) systems has been groving, since latent heat storage systems can provide high storage capacity and isothermal behaviors [1]. However, all PCMs can react with aqueous solutions meaning the porous shell material is not good barrier for protection of PCM core from being dissolved in aqueous solution. Thus, changing of solvent [2, 3] makes it possible to obtain metal shell on the salt surface. This work proposes the technique of encapsulating the PCM core in a metal structure shell (macroencapsulation).

Sodium nitrate has been chosen as the PCM (Sociedad Química y Minera de Chile). The procedure of obtaining the core-shell structure was as follows: Sodium nitrate was first coated with hydrophobic layer, then with graphite and, finally, with copper from standart sulphate bath ($CuSO_4 \cdot 5H_2O$ 200 g/dm^3, H_2SO_4 100 g/dm^3). Top nickel layer was electrodeposited using aqueous and ethanol bathes. The main compounds of electrolytes were $NiCl_2 \cdot 6H_2O$ (200 g/dm^3), HCl (0,11 mol/dm^3). The density of ethanol was 0.8 g/cm^3. Electrodeposition was performed at 50 °C using a current density of 2.5 A/dm^2.

Cathodic polarizations curves in non-aqueous and aqueous solvents were obtained by linear polarization with potential scan rate of 0.005 V/s. Linear Tafel ranges ($\eta = a + b \log i$) of polarization curves corresponded to the charge transfer were used as a rate-determining step of Ni^{2+} reduction. The slopes of the linear regions were were 0.12±0.001 V/dec and 0.10±0.001 V/dec for the non-aqueous and aqueous bathes, respectively. The determined slopes values differed slightly from the theoretical value (0.12 V/dec) and indicates electrochemical stage as being the limiting one. Nickel electrodeposition onto copper substrate in presence of different solvents does not significantly change the b value indicating the charge transfer reaction is not controlled by the type of solvent.

It was found by the thermokinetic method that in the overpotential range from 0.1 to 0.4 V the process is limited by the electrochemical stage. There was a tendency of decreasing the effective activation energy at overpotential of 0.4 V by 40 kJ/mol when the aqueous solvent is replaced by a non-aqueous. In the overpotential region of 0.5–1.5 V, the value of the activation energy depends on the change of the potential, which may indicate diffusion as the limiting stage.

It is established that the current efficiency gradually decreases with increasing of the current density. Current efficiency in non-aqueous bath was

Table 1. Properties of nickel coatings obtained from aqueous and non-aqueous solutions

		Aqueous electrolyte	Non-aqueous electrolyte
Microhardness, HV		483	550
Porosity, pores on cm² (thickness of Ni 6/9/15 μm)		30/19/15	28/24/21
Microroughness R_a, nm / Maximum height, nm on the surface with dimensions of	20×20 μm	188/1680	164/1780
	4×4 μm	35/310	54/470
	0.8×0.8 μm	19.8/170	31.7/282

20 % higher than in aqueous one and indicates the occurring of the secondary reaction of hydrogen evolution.

Solvent plays a great role in the appearance of electrodeposited nickel coatings. Those obtained from non-aqueous and aqueous bathes have dark grey color and light grey color, respectively. Both solvents allow to obtain uniform coating with good adhesion. Nickel coating deposited from aqueous bath had a lot of small defects in form of pitting. The initiation of pits on the cathode surface can be attributed to the formation of hydrogen bubbles on the cathode surface, which adheres to the surface of the deposit. This, in turn, limits the deposition of metal at that point and the metal deposit continues to grow around it resulting in a pit at the location of the bubble. Due to it is coating is uneven. All the nickel coatings were found to be free from pores and cracks with nearly smooth surfaces.

The EDX analysis revealed that the deposited layer consists of pure Ni. Besides Ni, only Cu was found as a major constituent which belonging to the substrate. XRD analysis revealed stable fcc crystal structure of Ni. AFM analysis showed a surface spotted with relatively large, flat or pyramidal crystals, above a layer of roundish particles with a maximum height 1680 nm suggesting that crystal growth from non-aqueous bath occurs with fast nucleation, followed by a preferential growth on active sites. Changing of solvent strongly modifies the growth characteristics and the crystal habit. On the surface appears sharp grains.

Main properties of nickel coatings obtained from aqueous and non-aqueous solutions are shown in Table.

Kinetic features and properties of nickel coatings were established during electrodeposition from electrolytes with various solvents.

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PROPERTIES STUDY OF POLYMERIC PETROLEUM RESINS THAT CONTAIN A NITROGEN GROUP

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Most petrochemical plants generate significant amounts of intermediate products and by-products of refining, which do not find adequate application. Some of the by-products continue to be waste, whereas other could be used as raw stock to obtain new substances and materials. These by-products consist of fraction of liquid pyrolysis products, which are used for production of petroleum polymer resins (PPR_s).

In this work, C_9 fraction and dicyclopentadiene fraction (DPF) are the raw stock for PPR_s. The fraction C_9 consists of saturated hydrocarbons, such as benzene, toluene, xylene, propylbenzene, ethylbenzene, ethylmethylbenzene and unsaturated hydrocarbons, such as cyclopentadiene, styrene, vinyltoluene, α-methylstyrene, β-methylstyrene, dicyclopentadiene, methyldicyclopentadiene, and indene [1]. DPF fraction also include saturated and