PREPARATION OF OLIGOMERS CONTAINING NITROGEN AND SULFUR BASED ON SODIUM TETRASULFIDE AND MELAMINE-CYANIDE ADDUCT.

Berdiev Sanjar Allanazarovich
Doctor of Philosophy in Technical Sciences (PhD), Researcher of Tashkent scientific research institute of chemical technology Tashkent, Uzbekistan,
ORCID: 0009-0005-1516-2840
sanjarberdiev75@gmail.com

Abstract. *The effectiveness of sulfur-containing compounds used as additives to improve the properties of oils is determined by their structure. Under friction conditions, strongly bound sulfur forms complex complexes with metals; such compounds prevent wear and in many cases have anti-corrosion properties, which has been proven in practice.*

Keywords: *sodium tetrasulfide, melamine-cyanide, adduct, anti-corrosion properties, oligomers, nitrogen, sulfur.*

At high temperatures in active friction zones, weakly bound sulfur compounds chemically bind to the friction surface and improve the properties of the oil. Anti-wear additives prevent severe wear of surfaces operating without jamming (pressure) under normal friction. As a result of moderate pressure, load and temperature, surfactants can generally act as anti-erosion agents. However, additives that react with the metal surface at high temperatures and form films that prevent friction with the surface are used as anti-erosion additives. Such substances contain sulfur atoms. The cheapest and most common anti-wear additive containing sulfur atoms are oils saturated with sulfur (fuel oil) [2]. Black oil is formed using elemental sulfur (S) with sulfur atoms attached to a cyclooctane sulfate ring. With the help of catalysts, the cyclooctanesulfanate ring is broken, and the disulfide bonds are converted into an easily cleavable polysulfide chain [3].

Sulfur-saturated olefinic hydrocarbons or their polymers are widely used as highly effective anti-wear additives[4].

Experimental part: To carry out the reaction process, the reaction process was carried out in a 500 ml three-neck flask. First, 78 g of sodium sulfide is dissolved in 200 ml of solvent (water), 96 g of sulfur is added to the solution and the mixture is stirred with a mixer for 1 hour, influencing the temperature. The resulting sodium tetrasulfide is filtered and 50 g of purified sodium tetrasulfide is mixed in a flask at a temperature of 70-80 ◦C to obtain

basic organic lubricant additives. Then 20 g of dichlorohydrin and 0.15 g of ionic liquid catalyst (tetraethylammonium chloride) are added to the mixture. An ionic liquid (tetraethylammonium chloride) added to the reaction process acts as a catalyst. Then 76.5 g of melamine cyanurate adduct are added and the reaction mixture is kept at a temperature of 90-100°C for another 1.5 hours. The resulting oligomer precipitate is dried in an oven at a temperature of 50-60°C. The resulting product is 90% theoretical. He labeled the products with the NS-1 brand.

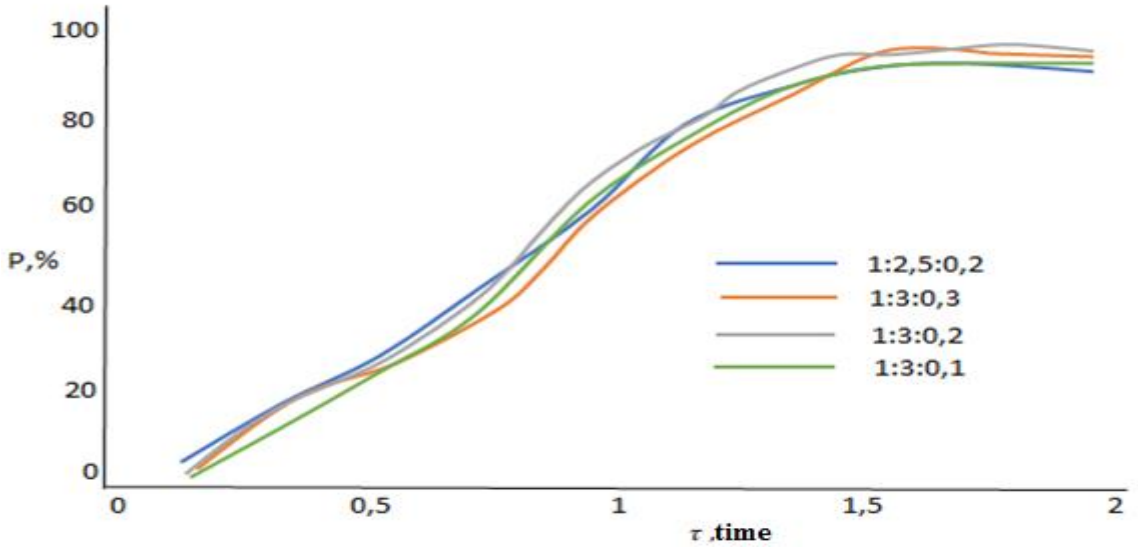

Figure 1. Reaction yield of NS-1 oligomer as a function of time at 90°C.

It has been studied that the reaction process for the synthesis of branded

NS-1 oligomers depends on the production time at a temperature of 90°C. The oligomer was obtained in the reaction with the highest yield at a reaction time of 1.5 hours. (Fig. 1) As a result of the experiments, in order to obtain a product with high yield from the NS-1 oligomer, it is necessary to obtain an equimolar ratio of the starting products according to Table 1.

Table 1.

Dependence of the reaction yield of NS-1 oligomers containing nitrogen and sulfur on the molar ratio of the initial monomers (90°C, τ = 1.5 hours)

Mole ratios of starting materials	Reaction yield, %	Molecular weight (cryoscopic method)	External appearance	Sulfur,%	
				Calculated	found
Sodium tetrasulfide/dichlorohydrin/melamine cyanurate adduct					
1:1:3	32	1050	Light brown liquid	37,5	36,9
1:0,5:3	19	982		24,3	20,7
1:0,25:3	17	1300		22,5	18,4

0,5:1:3	86	1100	Light brown liquid	35,0	34,3
0,25:1:3	83	1100		28,5	26,7
1:1:2	90	1080		36,5	35,8
1:1:1	81	1080	Light brown liquid	35,4	33,7
1:1:0,5	54	1100		37,7	36,2
1:1:0,25	47	1050		34,7	33,1
1:2:2	88	1100	Light brown liquid	35,4	34,7
2:1:2	76	1090		36,2	35,2
2:2:1	78	1000		37,0	36,5

As can be seen from Table 1, the oligomer of the NS-1 brand under optimal conditions (T = 90-100°C, t = 1.5 hours) with a ratio of sodium tetrasulfide adduct, dichlorohydrin and melamine cyanurate of 1:1:2 is higher. Than the NS-1 brand oligomer, a good product is obtained. The product yield is 90%; the resulting oligomer NS-1 contains 45% sulfur and has an average molecular weight of 1080.

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