STUDY OF THE STRUCTURE OF ANTI-CORROSION COATING BASED ON METHYL METHACRYLATE AND MONOETHANOLAMINE

Mahammadiyev T.M.,
Master student of Termez State University. Termez, Uzbekistan.
Kulbosheva Kh.Kh., Alikulov R.A.
[2]Faculty of Chemistry, Termez State University. Termez, Uzbekistan

Abstract. In this research work, the optimal conditions of a new type of organic anti-corrosion coating based on methyl methacrylate, monoethanolamine and ED-20 epoxy resin were studied. At first, a new compound was synthesized based on methyl methacrylate, monoethanolamine and its structure was studied by YAMR and PMR.

Keywords: organic anti-corrosion coating, methyl methacrylate, monoethanolamine, YAMR and PMR.

Introduction.

At the same time, corrosion is causing great damage not only to industrial infrastructures, but also to cultural heritage[1,2]. We can say that there is no sector that does not suffer from the corrosion process, for example: energy, transport, chemical and chemical technology, food and drinking water system, oil and gas production industry, pharmaceutical, engineering, construction. did not Corrosion of metal and reinforced concrete structures, pipelines carrying hydrocarbons and water, air, land and sea transport infrastructure, bridges, piers, marine structures, chemical plants and nuclear reactors, power plants, electronic devices, body implants, cultural heritage ob causing unprecedented damage to objects, artifacts and many other structures[3,4]. If we talk about the economic damage of this process, as an example, we can cite the following figures, for example: according to the results of international research conducted by NACE (IMPACT 2016) [5,6], the annual economic damage of the corrosion process worldwide is 2.5 trillion US it is concluded that it is $, if we analyze this figure in each country section, it is about 3.4% of the average gross domestic product (GDP) of each country. Searching for new types of anti-corrosion coatings with high efficiency and low cost, environmentally friendly in preventing the corrosion process remains one of the current directions of research[7,8].

Experimental part

IR-spectrum of the substance obtained on the basis of methyl methacrylate and monoethanolamine.

The composition and structure of this obtained anti-corrosion coating was studied using IR-spectrometer (IK-Fure, SHIMADZU, Japan) technology in the range up to 4000 cm^{-1} area (Fig. 1).

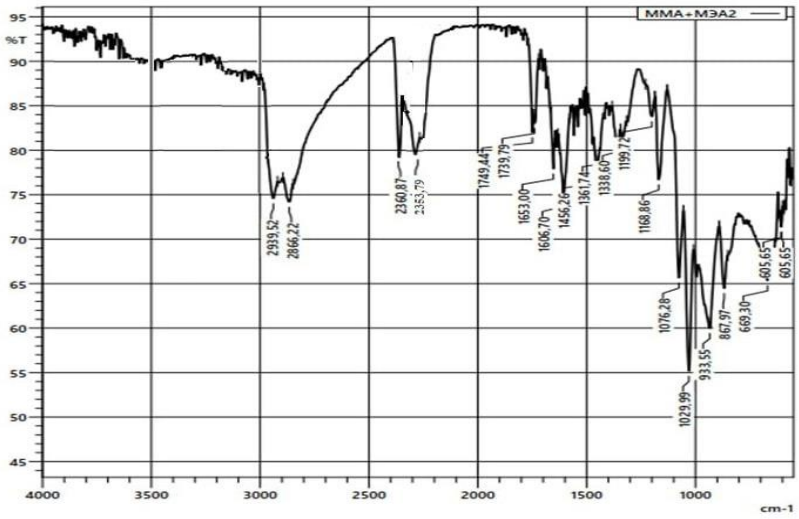
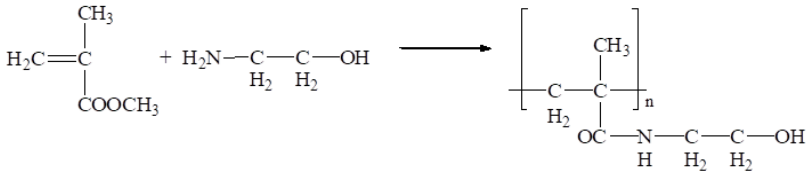


Figure 1. IR-spectrum of the substance obtained on the basis of methyl methacrylate and monoethanolamine

From the obtained IR-spectrum analysis, we can see that C-H in the methyl methacrylate monomer is in the area of 2989.66 cm^{-1}, -C=O is 1720.50 cm^{-1} for the double bond between carbon and oxygen, and 1300.02 for the carboxylate group. The valence vibrations of the cm^{-1} group were observed, the valence vibrations of the bonds for $–O\text{-}CH_3$ were observed in the 1637.56 cm^{-1} area, and a broad and intense absorption was observed. It can be seen here that valence fluctuations of specific bonds in the -OH or -C-N- bond were not observed in the original substance. The obtained spectra confirm the structure of the synthesized substance.



The gravimetric method is one of the widely used and effective methods for determining the corrosion rate of metal in laboratory conditions. In this case, the metal samples being tested are determined based on the difference in mass loss in the state of coating and without coating.

Corrosion medium containing 0.5 M H_2SO_4+200 mg/l NaCl was used as a working solution to determine the level of corrosion protection of this obtained anti-corrosion coating. According to GOST 9.506-87 by gravimetric method and at temperature range of 30-70 ºC, the speed of movement of working solutions in the system was determined at 1.1 m/s.

Table 1

Corrosion rate of steel 20, g/m2•h Corrosion rate and protection levels of coated and uncoated steel samples in 0.5 M H_2SO_4+200 mg/l NaCl environment

Coating, %		Temperature, ºC	Corrosion rate, g/m²•h0,5 M H_2SO_4+200 mg/l NaCl	Protection level, % (Z)
MFS-1	Without Coating	30	0,0112	–
		40	0,0196	–
		50	0,0287	–
		60	0,0450	–
		70	0,0522	–
	10	30	0,0028	74,08
		40	0,0025	77,17
		50	0,0021	79,15
		60	0,0018	82,02
		70	0,0014	85,13
	15	30	0,0029	75,11
		40	0,0044	77,81
		50	0,0049	79,91
		60	0,0056	83,14
		70	0,0047	89,04
	20	30	0,0008	77,16
		40	0,0009	79,23
		50	0,0012	85,23
		60	0,0019	90,22
		70	0,0021	9237
	25	30	0,0011	91,88
		40	0,0018	92,18

		50	0,0026	93,13
		60	0,0037	94,05
		70	0,0027	94,95
	35	30	0,0010	89,12
		40	0,0016	90,15
		50	0,0025	91,08
		60	0,0035	92,17
		70	0,0027	91,85

The above table mainly shows the results of the study of the corrosion rate and protection levels of the hybrid coating in two types of corrosion (0.5 M H_2SO_4+200 mg/l NaCl) environments. According to the obtained results, it was determined that the protective efficiency of the hybrid coating in a corrosive environment is higher than that of other percentage coatings (0.5 M H_2SO_4+200 mg/l NaCl).

The analysis of the conducted experiments showed that the rate of corrosion and the degree of protection of the anti-corrosion coating depend on the concentration of the anti-corrosion coating and the ambient temperature. It can be seen that the corrosion rate of steel at a certain temperature decreases with an increase in the concentration of anti-corrosion coating.

Conclusion.

In this research work, the optimal conditions for obtaining an anti-corrosion coating based on methyl methacrylate and monoethanolamine and ED-20 resin's structure was studied by IR-spectrum. It was found that the inhibition efficiency of this received anti-corrosion coating was 91.85% when studied by the gravimetric method.

References

1. Galedari, S.A., Mahdavi, A., Azarmi, F. *et al.* A Comprehensive Review of Corrosion Resistance of Thermally-Sprayed and Thermally-Diffused Protective Coatings on Steel Structures. *J Therm Spray Tech* **28**, 645–677 (2019).
2. Gabysheva, V.A., Baurova, N.I. Determination of the Influence of the Working Environment on the Development of Underfilm Corrosion of Machine Parts with Dispersed-Filled Polymer Coatings. *Polym. Sci. Ser. D* **15**, 90–95 (2022).
3. Chen, Y., Ye, Y. & Chen, ZR. Vapor-based synthesis of bilayer anti-corrosion polymer coatings with excellent barrier property and superhydrophobicity. *J Mater Sci* **54**, 5907–5917 (2019).
4. Muratov B.A, Turaev Kh. Kh, Umbarov I.A, Kasimov Sh.A, Nomozov A.K,

"Studying of Complexes of Zn(II) and Co(II) with Acyclovir (2-amino-9-((2-hydroxyethoxy)methyl)-1,9- dihydro-6H-purine-6-OH*)," International Journal of Engineering Trends and Technology* 2024**;** 72(1)**;** 202-208. https://doi.org/10.14445/22315381/IJETT-V72I1P120.

5. Nomozov A.K., Beknazarov Kh.S., Khodjamkulov S.Z.,Misirov Z.Kh. **Salsola Oppositifolia acid extract as a green corrosion inhibitor for carbon steel. Indian Journal of Chemical Technology. 2023; 30(6)**: **872-877. doi: 10.56042/ijct.v30i6.6553. .**

6. M.A. Shaymardanova., Kh.Ch. Mirzakulov., G. Melikulova., S.Z. Khodjamkulov, A.K., Nomozov., Kh.S. Shaymardanova. Study of process of obtaining monopotassium phosphate based on monosodium phosphate and potassium chloride. Chemical Problems. 2023**;** 3 (21): https://doi.org/10.32737/2221-8688-2023-3-279-293.

7. Nomozov A.K et all. Studying of Properties of Bitumen Modified based on Secondary Polymer Wastes Containing Zinc. International Journal of Engineering Trends and Technology. ISSN: 2231–5381 / https://doi.org/10.14445/22315381/IJETT-V71I9P222.

8. Nurilloev Zafar, Beknazarov Khasan and Nomozov Abror, "Production of Corrosion Inhibitors Based on Crotonaldehyde and Their Inhibitory Properties," *International Journal of Engineering Trends and Technology*., 2022, vol. **70**, 8, pp. 423-434, Crossref, https://doi.org/10.14445/22315381/IJETT-V70I8P243.

9. Durdubaeva R., Beknazarov S., Nomozov A. SYNTHESIS OF 2, 4, 6-TRIETHANOLIMINE-1, 3, 5-TRIAZINE AND ITS APPLICATION AS A CORROSION INHIBITOR OF CARBON STEEL IN 0.5 M H_2SO_4 SOLUTION //Science and Innovation. – 2022. – Т. 1. – №. 8. – С. 613-618.