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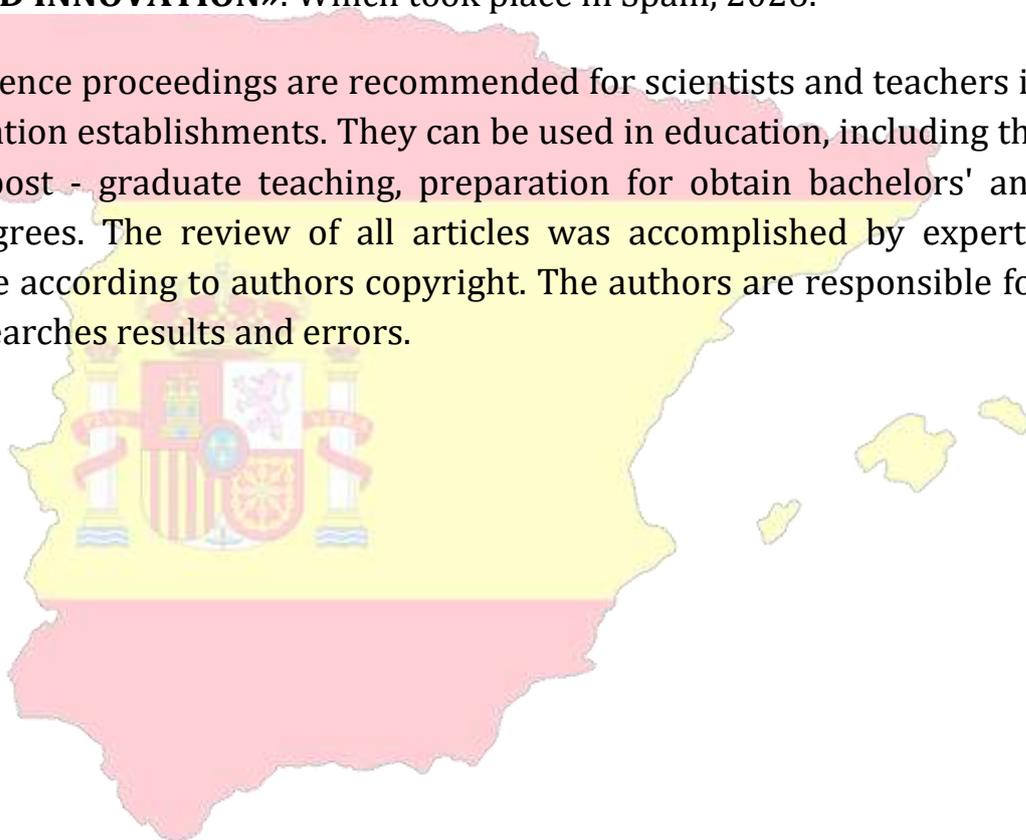


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SYNTHESIS OF CATIONITE BASED ON INDENE, A SECONDARY PRODUCT OF HYDROCARBON PYROLYSIS

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Introduction. In recent years, Uzbekistan's chemical industry has been rapidly developing; however, the secondary products from pyrolysis processes remain underutilized. In particular, it has been found that the pyrolysis oil contains the aromatic hydrocarbon indene. According to the authors of the study, the proportion of indene in the oil obtained from continuous hydrocarbon pyrolysis is approximately 10% [1]. Indene is a compound containing a benzene ring, and it can be processed further to serve as a raw material in the synthesis of valuable products. Therefore, extracting indene from pyrolysis oil and using it to synthesize polymer ion-exchange materials - cationites, which are widely used in the chemical industry - is an important problem [2]. The aim of this work is to extract indene from the pyrolysis oil obtained at gas processing plants (such as an automobile gas processing plant) and to synthesize a cationite from it that functions in sulfuric acid, specifically the polymethyleneindenesulfonate cationite [3].

Methodology. The study involved the following main steps: extraction of indene, sulfonation, conversion to the sodium salt, polymerization, and determination of the structure and properties of the resulting material.

Results and Discussion. The experimental results showed that indene obtained from pyrolysis oil was effectively separated using column chromatography and, after treatment with sulfuric acid, indene sulfate (indene sulfonic acid) was formed. According to IR spectroscopy, in the synthesized sulfonate, the absorption at 3427 cm^{-1} indicates the presence of -OH groups in indene (originating from the hydrolysis of the sulfonic acid). Vibrations in the range $1480\text{--}1583\text{ cm}^{-1}$ correspond to the deformation modes of the aromatic ring. Additionally, the absorption at 1095 cm^{-1} corresponds to the vibrational mode of the sulfonic group. These features confirm that $-\text{SO}_3\text{H}$ groups are successfully present in the cationite in the intended form. According to SEM and elemental analysis, the synthesized cationite sample contains 81.26% carbon, 14.38% oxygen, and 4.37% sulfur, which matches the expected elemental composition of the indene-based sulfonate polymer structure [4].

Thermogravimetric data (TGA/DTA) indicate that the cationite undergoes a three-stage decomposition upon heating. In the range $23\text{--}230^\circ\text{C}$, moisture and crystallization water are lost, resulting in approximately a 14.8% decrease in mass. In the range $230\text{--}491^\circ\text{C}$, 27.2% of the mass is lost, which corresponds to the decomposition of functional groups (-OH, $-\text{SO}_3\text{H}$). In the final range $491\text{--}801^\circ\text{C}$, another 16.2% of the mass is lost as the polymer backbone decomposes. Differential thermal analysis shows the presence of two endothermic and two

exothermic peaks: at low temperatures (41-95°C), an endothermic peak corresponds to the loss of hygroscopic water; two large exothermic peaks (221-384°C and 389-489°C) are associated with the condensation of -OH and -SO₂OH groups in the cationite, releasing water. Thermal analysis shows that the synthesized indene sulfonate cationite is relatively stable up to 230°C, but in the range 300-500°C the functional groups decompose causing a sharp change in composition. This behavior is similar to that of conventional synthetic cationites (such as KU-2) reported in previous studies.

Conclusion and Scientific Significance. In conclusion, this study has demonstrated the feasibility of extracting the valuable raw material indene from pyrolysis oil (a by-product of hydrocarbon pyrolysis) and using it to synthesize polymethyleneindenesulfonate cationite. In the procedure, the extracted indene was purified, sulfonated to its sodium salt, and polymerized with formaldehyde to produce a cationite rich in sulfonate functional groups. As reported, the newly synthesized cationite was confirmed by IR and SEM analyses, and its thermal stability and ion-exchange capacity were characterized [1].

References

1. Saidmansur Sh. Saidobbozov, Suvonkul E. Nurmanov, and Dilorom H. Mirkhamitova (2024) Synthesis of cationite based on indene, a secondary product of hydrocarbons pyrolysis, *Chemistry and Chemical Engineering*, Vol. 2024: No. 2, Article 7.
2. S. Saidobbozov, S. Nurmanov, O. Qodirov, et al. Extraction of indene from local pyrolysis oil and its usage for synthesis of a cationite. *Chemical Papers* 78 (2024): 8333–8350. DOI: 10.1007/s11696-024-03671-4.
3. B. Zhang et al. Recovery of rhenium from copper leach solutions using ion exchange with weak base resins. *Hydrometallurgy* (2017): 50–56.
4. A.P. Krivyenko and L.N. Astakhova (2008). *Electrophilic Substitution Reactions in Arenes*. Saratov: Nauchnaya Kniga, 54 p.
5. Saidmansur Sh. Saidobbozov, Suvonkul E. Nurmanov, Dilorom H. Mirkhamitova (2024). Chromato-mass and IR-spectral analysis of the indene fraction obtained from pyrolysis oil. *Universum: Chemistry and Biology*, 2(2 (116)): 12–17.