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OPPORTUNITIES FOR OBTAINING HYDROPHOBIC SPRAY IN TURKMENISTAN

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Introduction

Hydrophobic sprays are widely used in various industries due to their ability to repel water and prevent moisture-related damage. These coatings can be applied to different surfaces, including textiles, glass, metal, and wood, providing long-term protection against water, corrosion, and contamination. In Turkmenistan, a country with a growing interest in industrial diversification and technological innovation, the development and production of hydrophobic sprays present significant opportunities.

Turkmenistan’s Potential for Hydrophobic Spray Production

Turkmenistan's abundant natural resources, particularly in the petrochemical sector, provide a strong foundation for the production of hydrophobic sprays. The country is one of the largest producers of natural gas and has a well-established chemical industry that can be leveraged to produce key components such as silicones, fluoropolymers, and nanoparticles used in hydrophobic coatings.

Availability of Raw Materials

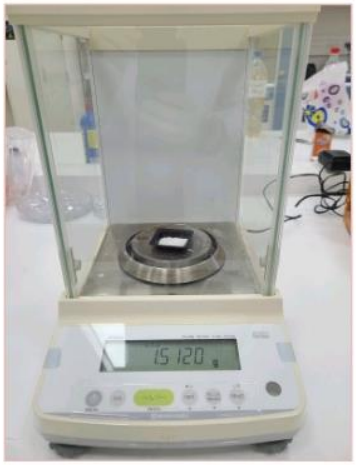
One of the critical factors in the production of hydrophobic sprays is the availability of high-quality raw materials. Turkmenistan has access to various natural resources that can be utilized in the synthesis of hydrophobic agents. For example, silica, a key component in many hydrophobic coatings, can be derived from sand, which is abundant in the Karakum Desert.

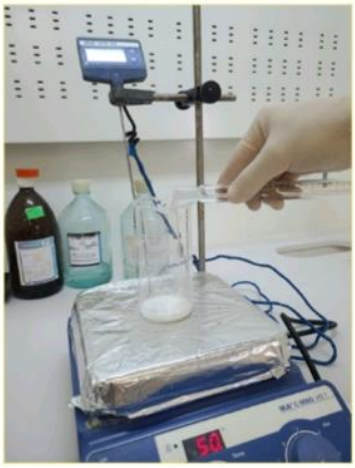
Technological Capabilities and Infrastructure

Turkmenistan has been investing in modernizing its industrial infrastructure, particularly in the chemical and petrochemical sectors. The establishment of new research facilities and collaborations with international experts can facilitate the development of advanced hydrophobic formulations tailored to the needs of local and international markets.

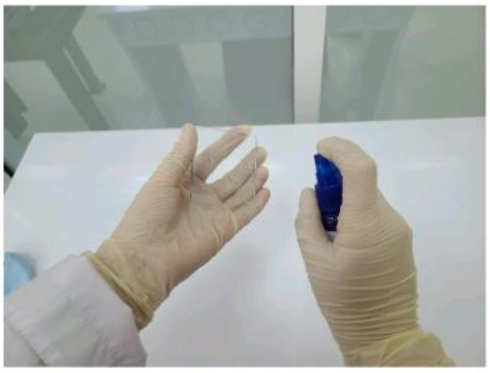
Used the following equipment and reagents in this experiment:

Analytical balance, beaker 500ml, pipette, erlenmeyer flask, $Ti(OC_3H_7)_4$, or titanium dioxide powder - 1,5 gr, C_2H_5OH - 11.2ml, $C_4H_5NO_2$ - 1ml of water solution.





The titanium dioxide powder was prepared by sol-gel process using titanium isopropoxide, $[Ti(OC_3H_7)_4]$, as a precursor and ethanol as a solvent. After dissolution of 11.2 mL of $[Ti(OC_3H_7)_4]$, in ethanol, a solution of 0.73 ml water in ethanol was mixed and 1 mL diethenol amine $C_4H_5NO_2$ added dropwise under continuous stirring for 2h to realize a transparent sol. $[Ti(OC_3H_7)_4]$: C_2H_5OH: H_2O: $C_4H_5NO_2$, molar ratio was set at 4:140:4:1. The sol was digested for 24h and dried subsequently at 100°C for 10h, calcined for 2h elevated temperatures, and cooled at a rate of ~ 8.3 °C /min Thermogravimetric analysis (TGA) of the dried sol-gel product was carried out by raising its temperature at a rate of 4°C/min from 50 to 850'C in air to ascertain the conditions of TiO, formation. While an X-ray diffractometer (Thermo Electron ARL XQ TRA) with the CuK] radiation was used for identification of phase(s) and determining the average crystallite size, fourier transform infrared (FTIR) spectrometer (BRUKER Vertex-70) was employed for ascertaining the bonds and stretching modes



present. A field emission scanning electron microscope (Carl Zeiss modal Supra 40VP) and UV-Vis-IR spectrophotometer (Varian, model Cary 5000) were used for observing the morphology and optical absorption behaviour, respectively. A spectrofluorophotometer (Edinburg Instruments model FLSP 920) was utilized to study the photoluminescence characteristics of the final product.

Environmental and Climatic Advantages

The climatic conditions of Turkmenistan, characterized by arid and semi-arid regions, further emphasize the need for hydrophobic technologies. Hydrophobic sprays can be particularly beneficial in protecting agricultural equipment, infrastructure, and textiles from moisture damage during rare but intense rainfall events.

Market Opportunities and Economic Impact

The global demand for hydrophobic coatings is increasing, driven by industries such as construction, automotive, and consumer goods. Turkmenistan can position itself as a regional hub for the production and export of hydrophobic sprays, capitalizing on its strategic location and access to neighboring markets in Central Asia, the Middle East, and Europe.

Conclusion

The development of hydrophobic sprays in Turkmenistan represents a promising opportunity for economic growth and industrial diversification. By leveraging its natural resources, technological capabilities, and strategic location, the country can establish itself as a key player in the global market for advanced surface protection technologies.