FEATURES OF MICROWAVE RADIATION OF SUSTAINABLE WATER-OIL EMULSIONS

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Abstract: *in recent years, oil production is growing due to the extraction from the depths of a significant amount of produced water in the form of oil-water emulsions. This is facilitated by the presence of heavy hydrocarbons, acids, dispersed mechanical impurities, mineral salts, etc. The complex composition of water-oil emulsions requires the use of non-traditional or combined methods of their destruction. Microwave radiation is considered one of the ways to intensify the separation of water, mechanical impurities, salts, etc. of substances associated with oil. Studies have shown the effectiveness of microwave radiation on the processes of oil preparation.*

Keywords: *water-oil words, microwave radiation, ultra-high frequencies, dipole, coagulation, polar components, reservation sheath.*

ОСОБЕННОСТИ МИКРОВОЛНОВОГО ИЗЛУЧЕНИЯ УСТОЙЧИВЫХ ВОДОНЕФТЯНЫХ ЭМУЛЬСИЙ

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Аннотация: *за последние годы добыча нефти растет за счет извлечения из недр значительного количества пластовой воды в виде водонефтяных эмульсий. Этому способствует наличие в добываемой нефти тяжелых углеводородов, кислот, дисперсных механических примесей, минеральных солей и т.п. Сложный состав водонефтяных эмульсий требует применения нетрадиционных или комбинированных способов их разрушения. Микроволновые излучения считаются одним из способов интенсификации разделения воды, механических примесей, солей и т.п. веществ, сопутствующих нефти. Проведенные исследования показали эффективность применения микроволнового излучения на процессы подготовки нефти.*

Ключевые слова: *водонефтяные слова, микроволновые излучения, сверхвысокие частоты, диполь, коагуляция, полярные компоненты, бронирующая оболочка.*

The annual growth in the production of sustainable water-oil emulsions (WOE) in Uzbekistan requires the search and application of unconventional methods for their destruction, together with a thermochemical method of dehydration and desalting of the oils produced.

These methods include microwave radiation-resistant WOE, which is used in chemical, petrochemical and other industries.

Today of practical interest are microwave radiations with ultra-high frequency (UHF) in the frequency range from 300 MHz to 300 GHz.

In this range, the wavelength varies from 30 cm to 1 mm in free space, for which they are called the range of decimeter and centimeter waves [1].

During the application of microwave radiation, the size of the colloid-dispersive phase of the OWE and its rheological properties change significantly. In this case, due to the absorption of microwave energy, the OWE is heated and the polarity of the substances contained in it is changed. For example, with microwave radiation at a frequency of 2450 MHz, polar or polarizable molecules or ions are oriented in accordance with the pulsations of the field.

It should be noted that due to the phase mismatch between the field oscillations and the rotation of the dipoles, the microwave radiation energy turns into the kinetic energy of the OWE molecules, due to which it is heated from the inside and throughout the volume, unlike the traditional convective surface heating during heat transfer. Therefore, by varying the frequency of microwave radiation, it is possible to selectively heat certain OWE components [2].

Currently, the produced sustained OWE in the Republic is mainly formed due to the high-resinous oils of OJSC «Djarkurganneft», where they are highly polar and surface-active substances (surfactants) with a molecular weight of 500-1200 and above. The resin complex contains the main amount of oxygen, sulfur and nitrogen compounds in oil. Unlike them, asphaltenes have 2-3 times more molecular weight and are solid amorphous substances of dark light. When microwave radiation such OWE, due to volumetric heating, a decrease in viscosity occurs and changes in their polarity, which favorably affects the processes of their dehydration and desalting. It also reduces the strength of the reservation sheath of water globules and due to changes in its adsorption properties and melting of paraffins [3].

Such a microwave effect accelerates the process of coagulation of water droplets and their deposition, which is achieved by increasing the difference in the densities of water and oil.

In the known microwave installations it is possible to regulate the radiation power and the time of exposure to stable OWE. Today, the following sanitary standards have been established, where the threshold values of the power fluxdensity (PFD) of microwave radiation for industrial installations of 10 mW/cm^2 are defined. It should also be replaced that in the high-frequency (HF) region (from 1 to 100 MHz) dispersion, the polar components of the oil prone orientational polarization and in the microwave region - the polarization of formation water molecules. Therefore, in this case, the main part of the energy is absorbed by the dispersed phase (water droplets), and the dispersed medium (oil) absorbs microwave energy much less.

The most significant effect of microwave radiation in comparison with traditional convective heating of stable OWE is accelerated by 2-3 times heating of the armoring sheath of water globules in the initial stage of microwave exposure.

Therefore, microwave radiation of stable OWE enough to hold periodically in a short time within 15-30 seconds (depending on the composition of the original oil).

Thus, summarizing this work, we can conclude that microwave radiation, by its mechanism of action on stable OWE, is fundamentally different from traditional methods of their thermochemical dehydration and desalting, regardless of the type and nature of the used demulsifier. Along with the economic effect of using microwave radiation, it is possible to achieve an increase in the quality of the preparation of oils for industrial processing.

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