

TECHNIQUE OF SOLUTION CONCENTRATION CONTROL OF POLAR SUBSTANCE IN NONPOLAR SOLVENT

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The investigation data relating to creation of control devices of chemical engineering processes such as control systems of diluted solutions of polar substances in nonpolar solvent, are given.

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1. INTRODUCTION

The series of technological devices in which it is necessary the maintenance of the polar substance solution concentration in nonpolar solvent with high accuracy, are known [1].

The known methods of control and maintenance of such solution concentration require regular discrete selection of solution tests, that are disadvantages of such technological devices. This leads to breakdown of technological process progress and takes a lot of time.

The closest one is the device the principle of its operation is based on application of control method of continuous supply of given solution of polar substance in nonpolar solvent [2,3]. It is necessary to note that the imperfection of mechanical system of solution supply at accuracy increase of maintenance of necessary solution concentration of polar substance in polar solvent is the disadvantage of such device.

The technique presented in the paper can be used for control of polar substance diluted solutions of polar substance in nonpolar solvent because of the fact that obtained systems can be used for formation of given wave ranges of non-reflecting absorbents containing in their composition the high-disperse polar liquids and their solutions in nonpolar solvent [4,5]. The absorbents of SHF radiation on the base of polar liquids and their solutions in non-polar solvent effectively utilize the residual and often undesirable electromagnetic radiation.

2. EXPERIMENTAL PART

The investigation task is the improvement of technique efficiency allowing us to continuously regulate the given concentration of polar substance in nonpolar solvent not stopping the technological process. The advantage of such technique is the fact that concentration accuracy doesn't decrease at decrease of solution concentration and vice versa, increases up to definite concentrations. It is established that the total absorption of incident radiation in solution can appear at definite selection of radiation frequency, solution composition and layer thickness, based on the papers on investigation of reflection characteristics of

electromagnetic radiation from polar substance layer in nonpolar solvent [6,7]. The computer with software allows us to continuously regulate the incident radiation frequency and the given polar substance concentration in nonpolar solvent not stopping technological process that allows us to obtain the required quantity of polar substance solution in nonpolar solvent. The last stabilization of this solution composition is supplied by autocompensation control system.

The method is based on creation of the device which allows us continuously regulate the incident radiation frequency and given polar substance concentration in nonpolar solvent not stopping the technological process. The device block-diagram allowing the control of the given polar substance concentration in nonpolar solvent consists in: 1 is the computer with specific software which allows us continuously regulate the incident radiation frequency and the given polar substance concentration in initial raw material not stopping the technological process; 2 is microwave radiation generator; 3 is the waveguide measure cell of flow type which is short-circuit in the end connected with generator; 4 is directed coupler with detector section. The stabilization of solution initial composition takes place by autocompensation control system; 5 is low-frequency modulator; 6 is amplifier detector section; 7 is phase detector; 8 is reversible engine; 9 is microadjust gate connected with axis of reversible engine; 10 is blender of solution polar component.

3. RESULT DISCUSSION

The stabilization system of the given composition of continuously proportioning solution of polar substance in initial raw material is given based on the effect of non-reflecting absorption of incident electromagnetic radiation.

The control of generator frequency and solution thickness layer in the cell is taken by conditions of non-reflecting radiation absorption for the given solution composition and it is supplied by computer with software during the period of whole chemical engineering process.

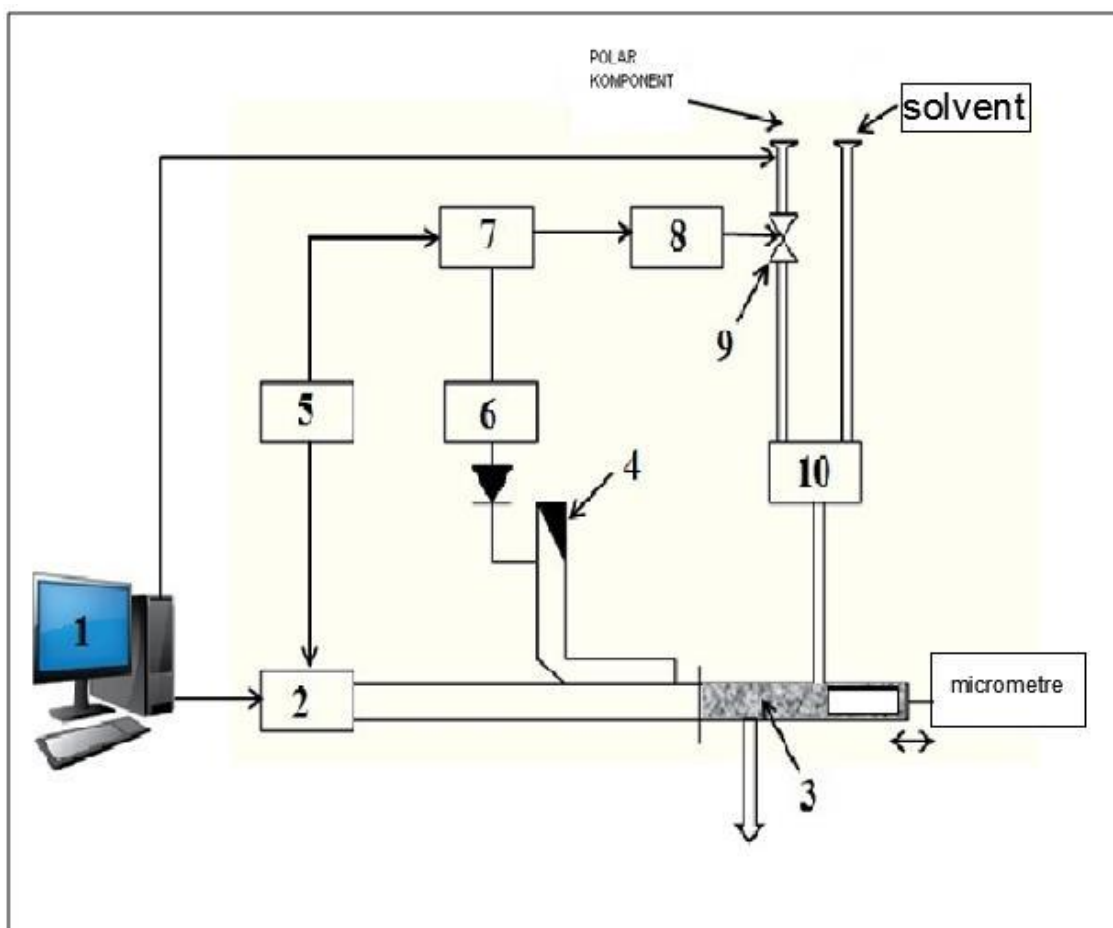


Fig. 1. The device block-diagram of concentration control of polar substance solution in nonpolar solvent.

The device works by the following way. The computer with software supplies the close control of generator frequency and also the thickness of the layer of the initial solution given into cell at which the conditions of total radiation absorption for the given solution composition are selected [8]. Further, the stabilization of solution initial composition by autocompensation control system which consists in low-frequency frequency modulator of generator output signal and amplifier for emphasizing and amplification of modulation action takes place. The outputs of these devices are connected with inputs of phase detector controlling the reversible engine work. The microadjust gate of supply of solution polar component into blender is connected with axis of reversible engine. The error signal is formed at composition value change on given one on the output of phase detector. The compensation control of composition value of proportioning solution up to the given value is carried out in the dependence on sign and value of error signal with the help of gate.

The graduation of stabilization system is carried out in two ways. Firstly, the characteristics of electromagnetic radiation reflection from layer of required solution of polar substance in non-polar solvent are taken. Later, graduation control is carried out at chosen concentration with switched off system of automatic maintenance of the given concentration.

4. CONCLUSION

The system of continuous control of chemical engineering processes and such as the control system of diluted solution concentrations of polar substances in non-polar solvent are supposed.

The improvement of device work efficiency allowing the continuously regulate the given concentration of polar substance in non-polar solvent not stopping technological process, is the task of the supposed technique. The computer with specific software is connected to device which allow us the continuous control the incident radiation frequency and given concentration of polar substance in non-polar solvent not stopping technological process. The given advice can be used for control of diluted solution concentrations of polar substances in non-polar solvent because of which obtained systems can be used at projection for the given range of wave length of SHF radiation absorbers consisting in the high-disperse polar liquid solutions in non-polar solvent. The task of the supposed technique is the improvement of device efficiency allowing continuously control the given concentration of polar substance in non-polar solvent not stopping technological process. The supposed technique is based on investigation of characteristics of electromagnetic radiation reflection from polar substance layer in non-polar solvent.

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