The effect of the device "IMEDIS-BRT-A" on a mixture of ethyl alcohol and water on the relaxation parameters of NMR of protons and deuterons of signals water and OH- groups of alcohol

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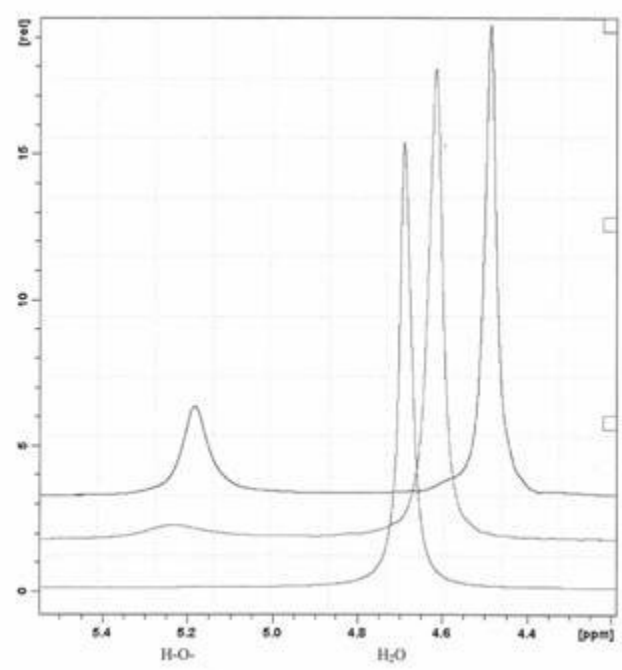
It is known that the proton magnetic resonance spectrum (NMR ^1H) ethyl alcohol consists of multiplets from CH_3, CH_2- groups and signal OH- groups of alcohol. When adding water to alcohol in the NMR spectrum[1]In the mixture "alcohol + water", a water signal appears, located next to the signal of the OH-groups of alcohol. With an increase in the concentration of water in the “alcohol + water” mixture, the signals of water and OH-groups of alcohol first broaden and then merge into one total signal. Such changes in the signals of water and OH-groups of alcohol in a mixture "alcohol + water" are due to proton exchange between water molecules and OH-groups of alcohol, and this exchange occurs by a barrier mechanism (tunnel effect). The objective of this study was to reveal the effect of the effect of the IMEDIS-BRT-A apparatus in the electron transfer mode [1] of the homeopathic preparation NaCl (C30, BRP mode) on the relaxation parameters of the signals of water and OH-groups of alcohol in the NMR spectra[1]N and [2]H mixtures.

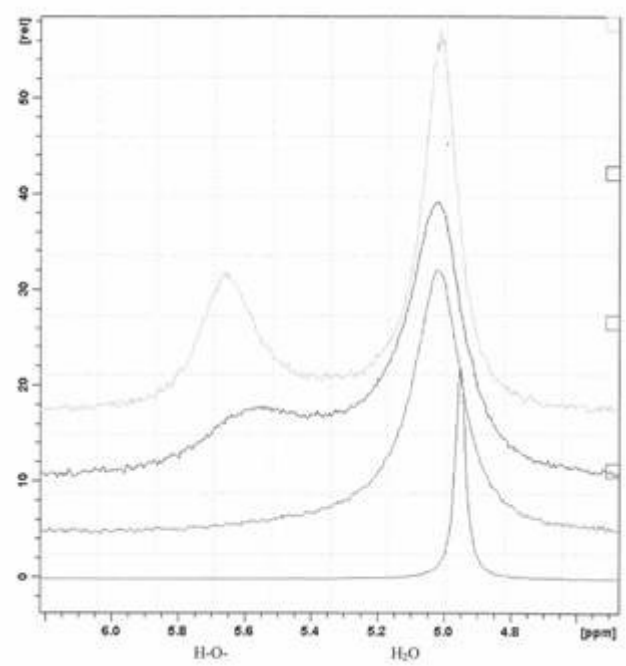
For this study, ten samples of mixtures with volumetric alcohol / water ratios of 0.25 were prepared; 0.5; 0.75; 1, 1.25; 1.5; 1.75; 3, 5 and 10, the mixtures being prepared by pouring alcohol into water. Also, ten samples of mixtures were prepared, which were prepared by pouring water into alcohol. Such differences in the preparation of samples of mixtures are due to the fact that, depending on the sequence of mixing the components, the structure and interaction of the components in the mixtures differ and it is advisable to identify these differences. To prepare the mixtures, we used distilled water with the addition of heavy water (D_2O, 5% by volume). Due to proton-deuteron exchange, deuterons are statistically distributed between water molecules and OH-groups of alcohol in mixtures. Thus, it became possible to obtain NMR spectra of mixtures with protons and deuterons.

In fig. Figures 1 and 2 show the characteristic stretched magnetic resonance spectra of protons and deuterons of three mixtures. It can be seen from the figures that at a low water content (X = alcohol / water> 0.5), separate signals of water and OH groups of alcohol are observed in the spectra, and at a higher water content (alcohol / water <0.75), one total signal H_2UN. When in the NMR spectra[1]N and [2]For H mixtures, separate signals from water and OH groups of alcohol are observed, the line widths at half maximum (Y) are determined by the spin-spin relaxation times (T_2) and the lifetimes of protons and deuterons in water molecules and OH groups of alcohol (t): $Y = 1 / (\pi T_2) + 1 / t$. When in the spectra[1]N and [2]H mixtures, single lines are observed from the total signal H_2O / OH, the line width at half maximum (Y) of the total signal is determined by the populations of water molecules (P_{H2O}) and OH-groups of alcohol (P_{OR}):

$Y = P_{H2O}(1 / T_{2\,(H2O)}) + P_{OH}(1 / T_{2\,(OH)})$, where $P_{H2O} + P_{OH} = 1$. From these relations it follows that the line widths at half maximum of the signals of water and OH-groups of alcohol in mixtures "water + alcohol" are determined by the times of spin-spin relaxation, the lifetimes of protons and deuterons in H_2About and OH- groups and alcohol / water ratios. If the effect on the mixture during transfer changes the spin-spin relaxation times and the lifetimes of protons and deuterons of the water molecule and the OH-groups of alcohol, then it should manifest itself in changes in the line widths at half-height of the signals H_2O and OH-groups in NMR spectra $_1$N and $_2$N.

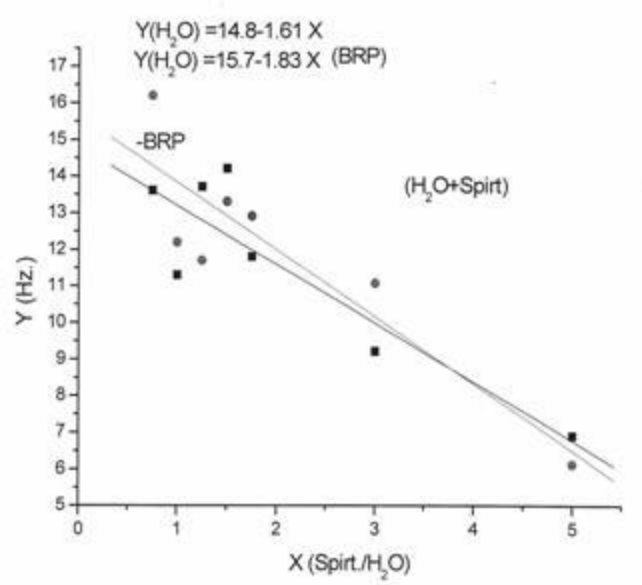


Rice. 1. Stretched NMR spectra$_1$H (300.21 MHz) mixtures of water and ethyl alcohol with volumetric water / alcohol ratios (spectra from bottom to top) - 1 / 0.25; 1/1 and 1/3.



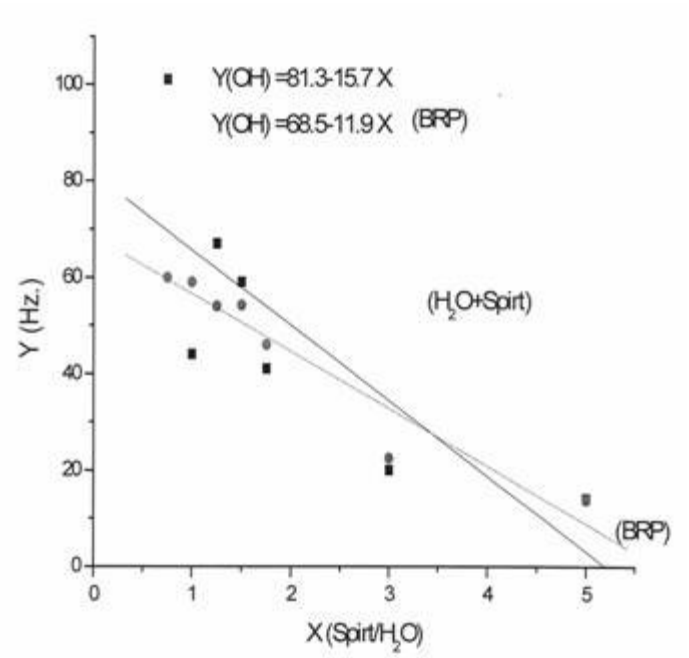
Rice. 2. Stretched NMR spectra^{2}H (46.08 MHz) mixtures of water and ethyl alcohol with volumetric water / alcohol ratios (spectra from bottom to top) - 1 / 0.25; 1 / 1.75, 1/3 and 1/5.

In fig. Figures 3–8 show the dependences of the line widths at half maximum (Y) of the signals of water and OH-groups of alcohol on the ratio Alcohol / Water (X) for the samples before and after exposure (BRP mode). The same figures show curves and expressions obtained by iterative approximation of the data obtained by polynomials of the first and second degrees (OROJIN program). It follows from these data that mixtures prepared by pouring water into alcohol (Fig. 5) differ in the dependences of the NMR relaxation parameters^{1}H signals of water on other dependences of relaxation parameters on the ratio Alcohol / Water radically. Only for these dependences (Fig. 5) there is first an increase in the line width (Y) at half-height of the wave signal and a subsequent decrease in Y with an increase in the ratio X = Alcohol / Water from 0.5 to 5.0; with this, a maximum of dependences is observed. Exposure to the device "IMEDIS-BRT-A" leads to a shift in the maximum X = Alcohol / Water from 3 (before treatment) to 2.5 (after BRP-treatment).

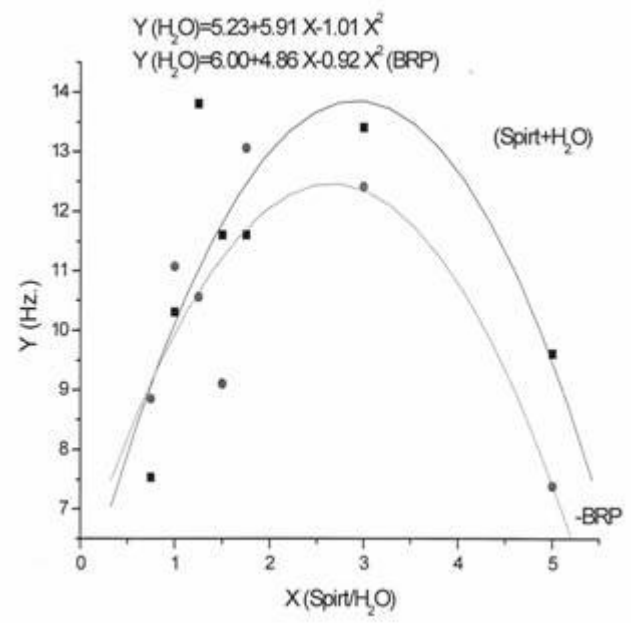


Rice. 3. Dependence of the line width at half height (Y in Hz) of the water signal in the NMR spectra 1H mixtures of ethyl alcohol and water from the volumetric ratios X = Alcohol / Water. The mixtures are prepared by pouring alcohol into water; the dependence, designated as BRP, corresponds to the mixtures subjected to bioresonance transfer of the homeopathic preparation NaCl (C30) by the device "IMEDIS-BRT-A".

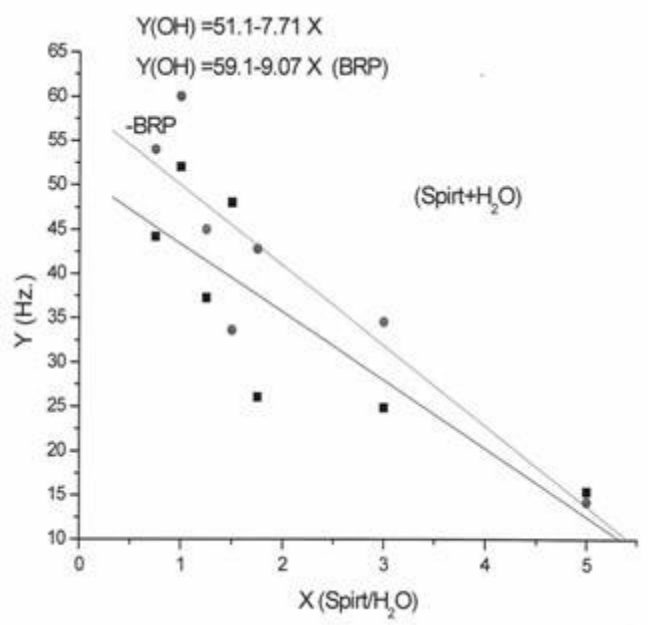
The rest of the dependences of the line widths at half-height of the signals H2O and OH-groups (Fig. 4, 6, 7 and 8) on the ratio X = Alcohol / Water are well approximated by linear dependences (shown in the figures), and with an increase in X the line width at half maximum Y for protons decreases linearly, and for deuterons increase linearly. The effect of the "IMEDIS-BRT-A" apparatus on the "water + alcohol" mixtures manifests itself in changes in the parameters of the linear approximation of the dependences of the line widths of the signals of water and OH- groups on the ratio X = Alcohol / Water (see Fig. 4, 6, 7 and 8) ...



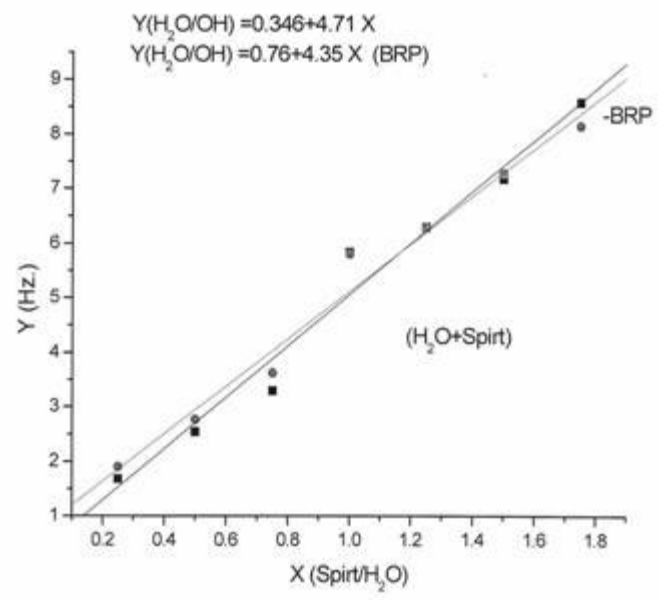
Rice. 4. Dependence of the line width at half height (Y in Hz) of the signal of the OH-group of alcohol in the NMR spectra 1H mixtures of ethyl alcohol and water from the volumetric ratios X = Alcohol / Water. The mixtures are prepared by pouring alcohol into water; the dependence, designated as BRP, corresponds to the mixtures subjected to bioresonance transfer of the homeopathic preparation NaCl (C30) by the device "IMEDIS-BRT-A".



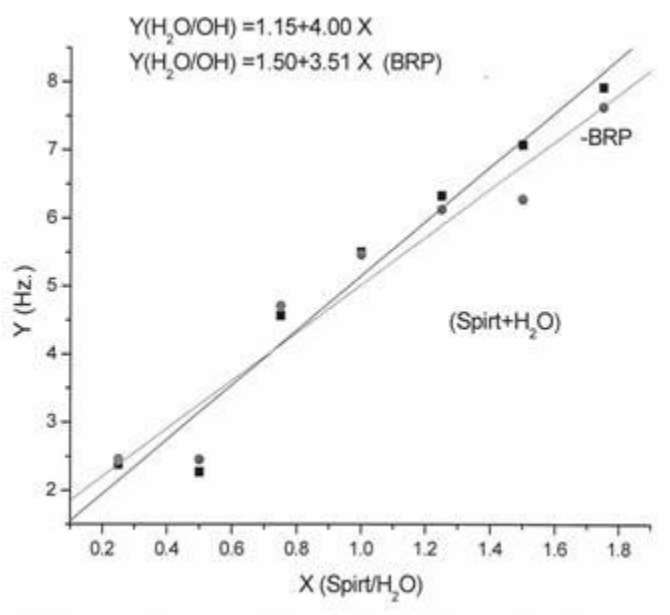
Rice. 5. Dependence of the line width at half height (Y in Hz) of the water signal in the NMR spectra 1H mixtures of ethyl alcohol and water from the volumetric ratios X = Alcohol / Water. The mixtures are prepared by pouring water into alcohol; the dependence, designated as BRP, corresponds to the mixtures subjected to bioresonance transfer of the homeopathic preparation NaCl (C30) by the device "IMEDIS-BRT-A".



Rice. 6. Dependence of the line width at half height (Y in Hz) of the signal of the OH-group of alcohol in the NMR spectra 1H mixtures of ethyl alcohol and water from the volumetric ratios X = Alcohol / Water. The mixtures are prepared by pouring water into alcohol; the dependence, designated as BRP, corresponds to the mixtures subjected to bioresonance transfer of the homeopathic preparation NaCl (C30) by the device "IMEDIS-BRT-A".



Rice. 7. Dependence of the line width at half maximum (Y in Hz.) Of the total signal of water and the OH-group of alcohol in the NMR spectra2H mixtures of ethyl alcohol and water from the volumetric ratios X = Alcohol / Water. The mixtures are prepared by pouring alcohol into water; the dependence, designated as BRP, corresponds to the mixtures subjected to bioresonance transfer of the homeopathic preparation NaCl (C30) by the device "IMEDIS-BRT-A".



Rice. 8. Dependence of the line width at half height (Y in Hz) of the total signal of water and the OH group of alcohol in the NMR spectra 2H mixtures of ethyl alcohol and water from the volumetric ratios X = Alcohol / Water. The mixtures are prepared by pouring water into alcohol; the dependence, designated as BRP, corresponds to the mixtures subjected to bioresonance transfer of the homeopathic preparation NaCl (C30) by the device "IMEDIS-BRT-A".

conclusions

The greatest effect of the "IMEDIS-BRT-A" apparatus in the transfer mode is manifested on the parameter of the line width at half maximum of the water signal in the NMR spectra 1H mixtures "water + ethyl alcohol" prepared by pouring water into alcohol (Fig. 5). In the range of ratios X = Alcohol / Water = 0.5–5, the line widths at half-height Y increase, reach a maximum at X = 3 before and X = 2.5 after exposure, and then decrease.

Apparently, when preparing mixtures "alcohol + water" by pouring water into alcohol, specific structures of hydrogen bonds and proton-proton, proton-deuteron exchanges between water molecules and OH-groups of alcohol are formed, the parameters of which change the most under the influence of the IMEDIS-BRT apparatus -A "in the range of ratio Alcohol / Water = 2–5.

Literature

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2. Kudryavtsev AB, Linert W. Physico-chemical applications of NMR. - London: World Scientific, 1996. - 356 p.

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