The new variant of the S-chamber with the ultra small gas volume

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INTRODUCTION

The using of the low-volatile mobile phase allows repeatable implementing TLC without a special chamber [1]. Traditional TLC may be repeatable implemented only using a chamber [2]. For the efficient separation in the conditions of unsaturated TLC it is expedient to use the chamber with the zero gas volume [3] or with the small gas volume, for example, the S-chamber proposed by Stahl long ago [4]. In the literature earlier there were described S-chambers only with the distance between the plate adsorption layer and the chamber wall (*d*) of more than 1 mm. The role of transitional processes in the S-chamber connected with the filling of the gas space with the saturated vapors of the mobile phase in the chamber might be minimized by sharply decreasing the value *d*.

According to the Einstein's equation of diffusion: $d^2=2Dt$ (where *d* is the average distance of diffusion, D is the diffusion coefficient, t is the time), the duration (t) of mobile phase molecules diffusion, for example, at the distance *d*=1.0 mm is 100 times is more than the time of molecules diffusion at the distance *d*=0.1 mm (Fig.1), in connection with what the role of the transitional processes in the S-chamber with the minimal gas volume must be substantially less than in case of the chamber with the big values *d*. That is why it seemed expedient to work out the S-chamber with the minimal meanings of the value *d* (and, correspondingly, gas volume).

EXPERIMENTAL PART AND RESULTS

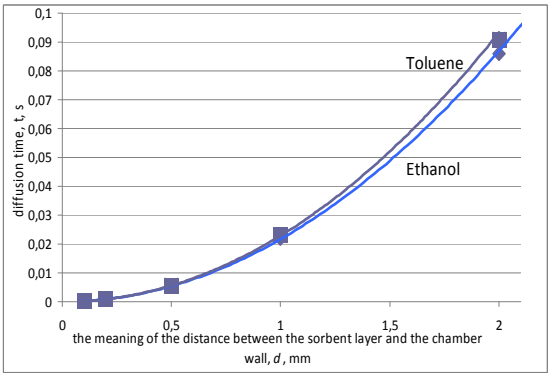

Fig.1. The dependence of the diffusion duration t, s on the value *d*, mm

The results of the S-chamber investigation are shown at the Fig. 2. The function (*1*) reflects the dependence of the time of the analysis (the time of the plate soaking) on the characteristic value *d*. The function (*2*) represents the dependence of the efficiency N on the characteristic value *d*.

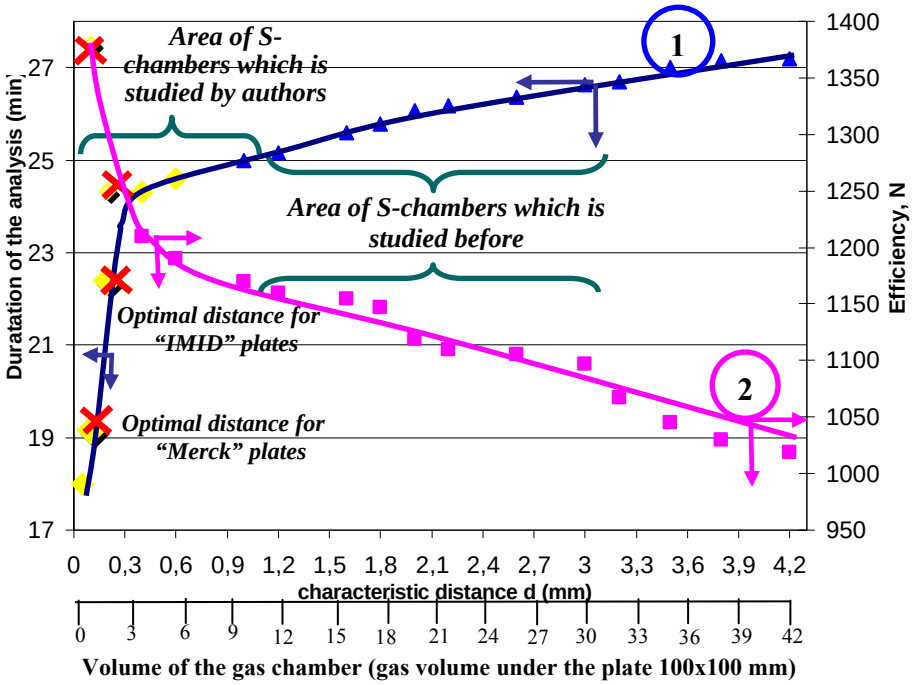

Fig. 2 [6]. The dependence of the duration of mobile phase migration (t, min) and the efficiency (N) on the characteristic value *d* in the S-chamber The experimental conditions: mobile phase (toluene) front moves on the plate on the total distance of 7 cm, plate 10x10 cm.

As it follows from the Fig.2, the decrease in the distance *d* allowed substantially increasing the velocity of equilibrium attaining between the vapor and liquid phases in the S-chamber. Using of S-chambers with the very little distance *d* results in the improvement of the rapidity of the analysis for *"Merck"* (Germany) plates by 25%, and for *"IMID"* (Russia) plates by 15% (compared to the most popular literature data for S-chambers with *d*=2 mm). The results obtained agree with the estimate of the diffusion time in the gas space of the chamber, according to the Einstein's equation. Maximal separation efficiency is also achieved in the chambers with the little distance *d* and it increases on average by 20% (compared to the most popular literature data for S-chambers with *d*=2 mm).

CONCLUSIONS

For the first time the main characteristics of the S-chamber depending on the value d were systematically studied, especially in the range of the small distance *d*=0.1-0.2 mm. The simple design of the new variant of the S-chamber with the optimal value *d* permitting to implement more rapid and more repeatable separations of the analyzed compounds was proposed.

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