

where $S_1 = 3(P^4 - 1)/4P(P^3 - 1)$ and $S_2 = 3(P^3 - 1)/4P^3$. The minimum value of t is obtained numerically by substituting various values of P into (6).

A comparison of minimum times can now be made between atmospheric and vacuum outlet. Typical capillary parameters are chosen as follows: $C_g/C_l = 10^{-6}$, $D_{g1} = 10^5$, $\eta = 10^{-4}$, $r_0 = 10^{-2}$, all in c.g.s. units. First, assume that easy separation requires 10^3 plates. The least time obtainable with $p_0 = 10^6$ dynes/cm.² (very close to one atmosphere) has been obtained from (6) as $t = 2.08NC_1/R$. The corresponding P is approximately 1.08. With a vacuum outlet, the minimum $t = 1.26NC_1/R$ and $p_i = 2.30 \times 10^5$ dynes/cm.² (≈ 0.25 atm.). Thus the time required with atmospheric outlet is 1.66 times larger than the vacuum outlet time.

Assume that a more difficult separation requires $N = 10^4$. With $p_0 = 10^6$ dynes/cm.², the best parameters are $t = 2.90NC_1/R$ and $P = 1.8$. With $p_0 = 0$, the best parameters are $t = 2.51NC_1/R$ and $p_i = 1.34 \times 10^6$ dynes/cm.² (≈ 1.3 atm.). The time ratio in this case is 1.15.

The above examples show that time for analysis can be reduced by operating the outlet at very low pressures. The reduction in time depends on a number of factors. As shown above, it is least for very large plate requirements. This is true since the inlet pressures approach one another for very large plate requirements, and there is very little difference in the average performance of the columns. The reduction in time increases, also, with s , a measure of the relative mass transfer resistance in the gas phase compared with the liquid phase. In the examples above, the two terms are assumed equal ($s = 10^{-6}$) at atmospheric pressure.

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Inhibition of Ultrasonic Decolorization of Rhodamine B in Presence of Organic Substances

ULTRASONIC waves obtained from Mullard's high-frequency ultrasonic generator type E-7562 with a barium titanate transducer having a frequency of 1 Mc./sec. were passed into the aqueous solution of rhodamine B and it was found that the solution was decolorized after some time. These waves were found to decolorize aqueous solutions of congo red, chrysoidine, aniline blue and brilliant green also¹. 20 ml. of an aqueous solution (0.0064 gm./l.) of rhodamine B and 5 ml. distilled water in a Jena glass bottle were held vertically above the transducer and the position so adjusted as to produce maximum fountain inside the vessel on passing the ultrasound. When, however, 20 ml. of the same solution and 4 ml. of distilled water were taken and 1 ml. of methyl alcohol, ethyl alcohol, *n*-propyl alcohol, *n*-butyl alcohol, diacetone alcohol,

acetone, dioxan or ether were added separately, and the mixtures exposed to ultrasonic radiation under the same conditions as before, very little change in colour was observed, even when the time of exposure of the solutions containing these substances was almost doubled (Table 1). The colorimetric readings were recorded on a Klett Summerson photoelectric colorimeter using a No. 54 filter, which covers a range of 520-580 m μ . Readings for the dye solution exposed without adding any organic substance are shown in the second column (blank).

Table 1
Colorimetric readings in presence of:

Exposure (min.)	Blank	Colorimetric readings in presence of:							
		Methyl alcohol	ethyl alcohol	<i>n</i> -propyl alcohol	<i>n</i> -butyl alcohol	Diacetone	Acetone	Dioxan	Ether
0	338	338	338	337	338	337	338	338	337
5	126	313	330	335	337	330	335	337	334
10	65	310	327	333	335	328	333	334	333
15	44	292	323	332	334	325	332	327	—
20	33	—	312	332	331	323	331	323	331
25	—	252	307	331	331	320	330	313	331
30	21	—	—	—	—	—	—	—	—
50	—	216	290	327	329	310	325	306	330

Virtanen and Ellfolk² noted that the ultrasonic oxidations caused by cavitation may be inhibited by substances with a high vapour pressure. Oxidative nitrogen fixation in an ultrasonic field is inhibited by more than 50 per cent by volatile substances such as aliphatic fatty acids, aldehydes, alcohols and aromatic hydrocarbons. Bresler³ observed that by the addition of substances of high vapour pressure, such as ether or ammonia, the breakdown of the cavitation bubbles is prevented, and the luminescence of luminol otherwise produced by ultrasonic vibrations is prevented. Mellaerts⁴ has reported that water treated with ultrasonic waves exhibits a non-uniform luminescence. This luminescence can be suppressed by the presence of some substances with high vapour pressure, for example, ether and acetone. In our case also, the substances added are of high vapour pressure and they prevent the breaking of the cavities and hence the inhibition of the decolorization of rhodamine B solution.

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Viscosity-Temperature Relationships for Dilute Solutions of High Polymers

INVESTIGATIONS of the viscosities of dilute solutions of cellulose derivatives^{1,2} over a range of temperature have shown that the pre-exponential term A and the apparent activation energy of viscous flow Q in the viscosity-temperature relationship:

$$\eta = Ae^{Q/RT} \quad (1)$$

where η is the viscosity, depend on both the concentration c of the polymer and its molecular weight M . ($Q = Q_0$), where Q_0 is the value for the solvent, is generally a linear function of c in the range 0.1-0.4 gm./dl. and is a function of M . The value of A