FURTHER EXPERIMENTAL RESULTS ON THE ATTENUATION OF PRESSURE WAVES IN FLOWS OF WEAK POLYMER SOLUTIONS

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Further results are given on the experimental determination of the attenuation of a pressure wave in weak polymer solutions.

The preceding article [1] summarizes the results of an experimental study of the attenuation of pressure waves in flows of solutions of ammonia polyacrylamide (PAA) at various concentrations in water.

Using the same experimental apparatus and procedure as in [1], we continued to determine the attenuation of a pressure wave generated by water hammer in flows of higher-concentration solutions of PAA and weak solutions of polyethylene oxide (polyox) and alkali polyacrylamide (PA).

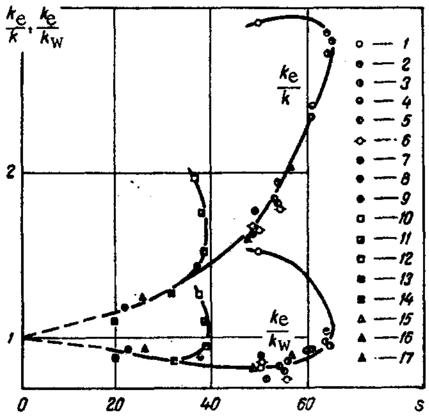

Fig. 1. Ratios k_e/k and k_e/k_w versus relative reduction s of the viscous friction (in %) for flows of aqueous polymer solutions. 1-9) Concentrations in g/cm^3 and kinematic viscosities in cm^2/sec of PAA solutions: 1) $1 \cdot 10^{-3}$, $2.92 \cdot 10^{-2}$; 2) $5 \cdot 10^{-4}$, $1.71 \cdot 10^{-2}$; 3) $3 \cdot 10^{-4}$, $1.61 \cdot 10^{-2}$; 4) $2 \cdot 10^{-4}$, $1.28 \cdot 10^{-2}$; 5) $1 \cdot 10^{-4}$, $1.23 \cdot 10^{-2}$; 6) $5 \cdot 10^{-5}$, $1.14 \cdot 10^{-2}$; 7) $24 \cdot 10^{-6}$, $1.11 \cdot 10^{-2}$; 8) $1 \cdot 10^{-5}$, $1.18 \cdot 10^{-2}$; 9) $5 \cdot 10^{-6}$, $1.06 \cdot 10^{-2}$. 10-14) Concentrations in g/cm^3 and kinematic viscosities in cm^2/sec of alkali polyacrylamide (PA) solutions: 10) $5 \cdot 10^{-4}$, $2.60 \cdot 10^{-2}$; 11) $4 \cdot 10^{-4}$, $2.01 \cdot 10^{-2}$; 12) $3 \cdot 10^{-4}$, $1.75 \cdot 10^{-2}$; 13) $1 \cdot 10^{-4}$, $1.28 \cdot 10^{-4}$; 14) $2 \cdot 10^{-5}$, $1.20 \cdot 10^{-2}$. 15-17) Concentrations in g/cm^3 and kinematic viscosities in cm^2/sec of polyox solutions: 15) $45 \cdot 10^{-6}$, $1.17 \cdot 10^{-2}$; 16) $1 \cdot 10^{-5}$, $1.16 \cdot 10^{-2}$; 17) $2 \cdot 10^{-6}$, $1.15 \cdot 10^{-2}$.

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The results are given in Fig. 1 as curves of k_e/k and k_e/k_w versus $s = 1 - \lambda_{0p}/\lambda_{0w}$, together with the results already given in [1]. Here k_e, k, k_w, s, λ_{0p}, and λ_{0w} have the same meaning and are determined the same way as in [1].

It is inferred from the experimental results that until an increase in the polymer concentration produces an appreciable reduction in the viscous friction effect, both k_e/k and k_e/k_w remain practically independent of the concentration and the type of polymer, being determined only by the value of the parameter s.

However, this single-valued dependence is upset as soon as the polymer concentration is increased to values at which the solution viscosity is significantly increased.

NOTATION

k, k_w	are the attenuation factors for flows of polymer solution and water, determined analytically;
k_e	is the experimental attenuation factor for a flow of polymer solution;
λ_{0p}, λ_{0w}	are the viscous friction coefficients for steady flows of polymer and water;
s	is the relative reduction of the viscous friction;
C	is the polymer concentration.

LITERATURE CITED

1. V. G. Ivannikov and G. D. Rozenberg, "Experimental study of the attenuation of pressure waves in flows of weak polyacrylamide solutions," Inzh.-Fiz. Zh., 25, No. 6 (1973).