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Main parameters of the Arrhenius-type equation. Def. 1

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The Arrhenius type-equation has proven to be reliable technique for describing the temperature dependence of various physical properties (Y) exhibiting linear behavior. This expressed can be represented in logarithm form as:

$$\ln Y = \ln As + Ea/R.(1/T) \quad (1)$$

Where ($\ln Y$) is the natural logarithm of the studied physical properties, (As) is a pre-exponential factor, E_a is the activation energy, R is the perfect gas constant, and (T) is the absolute temperature which must be expressed in Kelvin.

The main Arrhenius parameters, such as the activation energy (E_a), and the pre-exponential factor ($\ln A_s$), have been shown to remain independent of temperature over a not very large range of temperatures at constant atmospheric pressure.

The technique consists of the plot of ($\ln Y$) as a function of ($1/T$) and the use of linear least-squares fitting methods. By determining the slope of the straight line, which is similar to the activation energy (E_a/R), and the intercept on the ordinate, which is equal to the logarithm of pre-exponential factor ($\ln A_s$).

We must be careful for the unit of (Y), it can affect the unit of ($\ln A_s$) but not for (E_a). Also for the conversion of decimal logarithm if the we plot ($\log Y$). [1][2][3]

References

1. ^*Tahani Flemban, Ridha Hamdi, Hassan Alkhabbaz, Muidh Alheshibri, et al. (2022). Physicochemical Properties of Nanofluids Produced from Oxidized Nanoparticles Synthesized in a Liquid by Pulsed Laser Ablation. Lasers Manuf. Mater. Process., vol. 9 (1), 18-36. doi:10.1007/s40516-021-00160-4.*
2. ^*E. Mliki, T. K. Srinivasa, A. Messaâdi, N. O. Alzamel, et al. (2020). Hyperbolic Correlation between the Viscosity Arrhenius Parameters at Liquid Phase of Some Pure Newtonian Fluids and Their Normal Boiling Temperature. Russ. J. Phys. Chem., vol. 94 (1), 30-40. doi:10.1134/s0036024420010239.*
3. ^*N.O. Alzamel, F. Alakhras, A.A. Al-Arfaj, M.A. Al-Khaldi, et al. (2018). On the Homographic Dependence of Activation Energy and Viscosity Arrhenius' Temperature for Some Pure Fluids. Asian J. Chem., vol. 30 (9), 1937-1943. doi:10.14233/ajchem.2018.21319.*