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Development of an Equation for the Determination of Water Content in Alcohol Employing Certain Physical Properties

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Abstract

Food drinks, drugs and fuels are normally produced in standard ratios of the components making up the final products that give their best performances. Once the standard mixing ratio of the components of any standard liquid mixture is altered, the liquid product gives less performance and in some cases the liquid product causes accidents. Most of the machines used in the analyses of the components of liquids employ chemical analyses/properties of the liquids, which is always cumbersome and time consuming. Simple, quick and reliable techniques which use physical analyses/properties of the liquid can also be employed for the determination of solute content in a solution. A viscometer was designed and constructed and used to determine the time of flow, reduced time ratios, viscosity coefficients, reduced viscosity ratios of distilled water, alcohols, and their mixtures. Simple techniques were then developed that can determine the type and percentage volume concentration of water in alcohols at 308 K. A general equation was developed for the percentage water concentration in alcohol with the temperature fluctuations slightly above or below the calibration temperature, Tcal = 308 K as , where is the reduced time ratio or reduced viscosity ratio, T is the Kelvin temperature at which is determined, and D and S are values from the calibrated curve of that liquid mixture. For reduced time ratio, D = 0.821, S = 0.00142 for methanol (CH_3OH) and D = 1.418, S = 0.00398 for ethanol (C_2H_5OH). For reduced viscosity ratio, D = 0.681, S = 0.00245 for methanol (CH_3OH) and D = 1.261, S = 0.00475 for ethanol (C_2H_5OH). This equation was tested on ethanol collected from different sources and found to be much workable.

Keywords: Water content; Alcohol.