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Identification of Two Positional Isomers between Ortho-Vanillin and Para-Vanillin by their Inhibitory Effects on a Briggs-Rauscher Oscillator

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A suitable method by means of Briggs-Rauscher (BR) oscillating system as an analytical technique to identify the two positional isomers between ortho-vanillin (OV) and (para-)vanillin (PV) by their different perturbation effects has been proposed in this article. In BR system the macrocyclic Ni-complex, $[NiL](ClO_4)_2$ was used as catalyst, in which ligand L is 5,7,7,12,14,14-hexamethyl-1,4,8,11-tetraazacyclotetradeca-4,11-diene. The experimental data has proven that putting equal amount of same concentrations of these isomers (OV and PV) separately into the active BR system could cause the inhibition time (t_{in}). But the t_{in} initiated by OV is higher as compared to the t_{in} produced by PV. Our predication for such different inhibitory effects caused by these isomers may be due to their different existing strength of intermolecular hydrogen-bonding. Furthermore, by plotting t_{in} against the concentration of OV or PV, two linear regression curves were achieved for these two isomers in their concentrations range 2.5×10^{-6} mol L^{-1} to 4×10^{-5} mol L^{-1} with correlation coefficients of 0.98, which obviously illustrated the different behaviors of isomers. The perturbation reaction mechanism, involving hydroperoxyl radical ($HOO^•$) on the basis of FCA has been proposed. The description of the proposed mechanism is that these isomers react with hydroperoxyl radical to form a dimeric product (divanillin).

Keywords: Briggs-Rauscher Oscillator; Inhibition time; Isomers Identification; Ortho Vanillin; Para Vanillin

FULL TEXT