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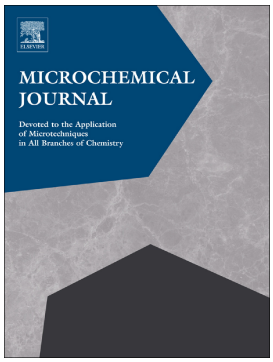

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Quantification of nicotine and major solvents in retail electronic cigarette fluids and vaped aerosols

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ABSTRACT

The main ingredients used in e-liquid formulations (propylene glycol (PG), vegetable glycerol (VG), and nicotine (Nic)) in a total of 16 retail e-liquids (half containing nicotine)) were analyzed by an analytical method developed recently by our research group. The measured nicotine concentrations in e-liquids varied in a range of 5.7 to 14.7 mg g^{-1} and differed up to 9.0% from the declared label concentrations (two tailed P = 0.5424 at a 0.05 confidence level). The concentrations of Nic and PG in vaped aerosol samples were lower (by an average of 12.7% and 17.4%, respectively) than those in e-liquid samples, while the opposite was true for VG (1.95% higher on average). The composition (w/w) of 16 retail e-liquids varied: 82.6 to 94.9% PG + VG (n=16), 0.68 to 1.63% nicotine (n=8), and 5.1 to 16.2% unidentified compounds (water, flavors, etc., n=16). For the corresponding vaped aerosols, the results were: 75.4 to 92.1% PG + VG (n=16), 0.57 to 1.47% nicotine (n=8), and 7.86 to 24.0% unidentified compounds (water, flavors, etc., n=16). The relative proportion of unidentified compounds in vaped aerosols was two times higher than those in e-liquids. The mean nicotine vaping emission factor (39.6 μg $puff^{-1}$) was about two times lower than that of a Kentucky 2R4F reference cigarette (75 μg $puff^{-1}$). The measured e-cigarette vaping emission factors varied in a range of 22.5-61.5 μg Nic $puff^{-1}$ (n=8), 1.04-2.45 mg PG $puff^{-1}$ (n=16), and 1.35-2.09 mg VG $puff^{-1}$ (n=16).

Keywords: E-cigarette, nicotine, commercial e-liquids, aerosol, vaping, emission factor

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1. Introduction