

Accepted Manuscript

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PII: S0026-265X(18)30429-6
DOI: doi:[10.1016/j.microc.2018.04.028](https://doi.org/10.1016/j.microc.2018.04.028)
Reference: MICROC 3142
To appear in: *Microchemical Journal*
Received date: 7 April 2018
Revised date: 25 April 2018
Accepted date: 25 April 2018

Please cite this article as: Jun Dai, Ki-Hyun Kim, Jan E. Szulejko, Sang-Hee Jo, Kyenghee Kwon, Dal Woong Choi, Quantification of nicotine and major solvents in retail electronic cigarette fluids and vaped aerosols. The address for the corresponding author was captured as affiliation for all authors. Please check if appropriate. *Microc*(2017), doi:[10.1016/j.microc.2018.04.028](https://doi.org/10.1016/j.microc.2018.04.028)

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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

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