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ABSTRACT

EXPERIMENTAL STUDY ABOUT THE INFLUENCE OF WIND VELOCITY AND TEMPERATURE ON THE EMISSION RATE OF VOCs FROM LIQUID SURFACE

Tagliaferri Francesca, Scolieri Giacomo, Invernizzi Marzio, Sironi Selena – Politecnico di Milano, P.zza Leonardo da Vinci, 32 – 20133, Milano

The characterization of passive liquid area sources for the study of Volatile Organic Compounds (VOCs) emission is a matter of great concern. The volatilization of these compounds is a complex phenomenon, being potentially affected by different chemical and physical parameters. Furthermore, scientific and technical literature is quite deficient in this regard.
In view of this, the present study aims to investigate the influence of wind velocity and temperature on the emission of VOCs from liquid surfaces. The results of this work represent a fundamental outcome for a dispersion modelling study, allowing the implementation of an emission rate consistent with the experimental evidence.
Currently, there are some studies (e.g. Parker et al. (2010)) concerning the influence of wind velocity on the evaporation from liquid surfaces. Overall, they propose the existence of two different mechanisms governing the mass transfer between liquid and gas phases. In some cases, VOC diffuses rapidly inside the liquid phase reaching the interface in short time. Here, the mass transfer mechanism is controlled by the VOC stripping due to the forced convection promoted by the wind velocity. Parker identifies these compounds as *gas phase controlled*. On the contrary, the emission of molecules which encounter the major resistance inside the liquid phase should not be affected by the air velocity (compounds referred to as *liquid phase controlled*).
Also, some parameters (e.g. vapour pressure, Henry's constant) that govern the volatilization phenomena are significantly affected by the temperature. For this reason, it is interesting to investigate the influence of this variable on the emission rate.
For the purpose of this study, the behaviour of three different acqueous solution of VOC compounds (a *liquid phase controlled,* a *gas phase controlled* and a *gas-liquid phase controlled,* i.e. with intermediate behavior) are examined by varying some parameters inside a wind tunnel system. In particular, the wind velocity flowing through the device is varied in a range from 0.02 m/s to about 0.06 m/s and the temperature of the liquid source in a range from 20 °C to 35 °C. The obtained results show as these three compounds approximately follow the expected theoretical behaviour. Indeed, the emission rate of the liquid phase and gas-liquid phase compound seems not to be affected by wind velocity whereas temperature has a great influence on the volatilization. Also, the variation of temperature majorly influences the emission rate of the compound whose vapour pressure is mostly affected by this parameter.

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