

Nitrous oxide emissions from gasohol, ethanol and CNG light duty vehicles

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Abstract A sample of 21 light duty vehicles powered by Otto cycle engines were tested on a chassis dynamometer to measure the exhaust emissions of nitrous oxide (N_2O). The tests were performed at the Vehicle Emission Laboratory of CETESB (Environmental Company of the State of Sao Paulo) using the US-FTP-75 (Federal Test Procedure) driving cycle. The sample tested included passenger cars running on three types of fuels used in Brazil: gasohol, ethanol and CNG. The measurement of N_2O was made using two methods: Non Dispersive InfraRed (NDIR) analyzer and Fourier Transform InfraRed spectroscopy (FTIR). Measurements of regulated pollutants were also made in order to establish correlations between N_2O and NO_x . The average N_2O emission factors obtained by the NDIR method was $78 \pm 41 \text{ mg.km}^{-1}$ for vehicles running with gasohol, $73 \pm 45 \text{ mg.km}^{-1}$ for ethanol vehicles and $171 \pm 69 \text{ mg.km}^{-1}$ for CNG vehicles. Seventeen results using the FTIR method were also obtained. For gasohol vehicles the results showed a good agreement between the two methods, with an average emission factor of $68 \pm 41 \text{ mg.km}^{-1}$. The FTIR measurement results of N_2O for ethanol and CNG vehicles were much lower than those obtained by the NDIR method. The emission factors were $17 \pm 10 \text{ mg.km}^{-1}$ and $33 \pm 17 \text{ mg.km}^{-1}$, respectively, possibly because of the interference of water vapor (present at a higher concentration in the exhaust gases of these vehicles) on measurements by the NDIR method.

1 Introduction

The relation between the anthropogenic emissions of greenhouse gases (GHG), the increase of their concentration in the atmosphere and the resulting rise in the temperature of the planet is largely accepted by the scientific community. A large source of greenhouse gas emissions is the transportation sector. The fuel consumption for that sector, beyond the

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