Redox activity of fine particle matter PM$_{2.5}$ samples collected at a bus station in Salvador City, Brazil

Robson M. de Jesus$^{1*}$ (PQ), Aline C. Mosca$^1$ (IC), Aline L. N. Guarieiro$^{2,3}$ (PQ), Gisele O. da Rocha$^{1,2}$ (PQ), Jailson B. de Andrade$^{1,2}$ (PQ)

*rmquimico3@yahoo.com.br

$^1$Universidade Federal da Bahia, Instituto de Química, Campus Ondina, CEP: 40170-270, Salvador-Ba, Brasil.

$^2$INCT em Energia e Ambiente, Universidade Federal da Bahia, CEP: 40170-290, Salvador-Ba, Brasil.

$^3$Cetel Odebrecht Ambiental, Praia de Botafogo 501, CEP: 22250-911, Rio de Janeiro-RJ, Brasil.

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Abstract
Redox activity from ambient particulate matter PM$_{2.5}$ was studied to measure its oxidative potential due to adverse effects in human health.

Introduction
Vehicle emissions are a major source of air pollution in urban areas throughout the world. Vehicles moved by fossil fuels, especially diesel, emit a complex mixture of toxic pollutant gases and particulate matter (PM). Redox activity from PM can be measured by reduction of oxygen through DTT assay. The rate of DTT consumption is increasingly used to measure the oxidative potential from PM, which has been linked to adverse human health effects. The present study aims to evaluate the redox activity using the dithiothreitol (DTT) assay from metals and organic compounds contained in SRM 1649b Urban Dust and particulate matter samples (PM$_{2.5}$) collected at a bus station in city of Salvador, Brazil.

Results and Discussion
This work carried out tests with SRM 1649b and SRM 1649b spike tests in order to better understand the DTT front of the oxidation rate behavior to chemical species: PAHs, nitro-PAHs, quinones and metals contained in the SRM. We then use these results to evaluate and compare the DTT oxidation rates by metals and organic species contained in ambient particulate matter. The metals present in SRM 1649b showed higher redox activity to produce reactive oxygen species (ROS) as compared to the absence of these species due to complexation reaction with DTPA, which significantly suppresses the response of redox activity of metals. DTT activities from SRM 1649b and SRM 1649b spike tests expressed as mass (of PM) and based in DTT activities are shown in Figure 1.

PM$_{2.5}$ samples (n=24) collected in eight days were analyzed; every day three samples were evaluated: one in the morning, one in the afternoon and one at night. Total DTT activities ranged 0.020-0.069 nmol min$^{-1}$ µg$^{-1}$, in which the median is 0.040 nmol min$^{-1}$ µg$^{-1}$. DTT activities from metals and organic compounds contained in PM$_{2.5}$ measured by DTT assay are shown in Figure 2.

Conclusions
Comparisons between soluble metallic species and organic compounds were performed to evaluate their relationship with redox activity in PM$_{2.5}$. It became clear that the metallic species contained in PM$_{2.5}$ has greater ability to catalyze reactions that generate reactive oxygen species. The execution of assays that quantify and/or identify species able to form reactive oxygen species are important to better assess the potential risks to human health that the population is exposed daily.

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References