INDOOR AIR QUALITY OF THE BRAZILIAN NATIONAL LIBRARY IN RIO DE JANEIRO, BRAZIL

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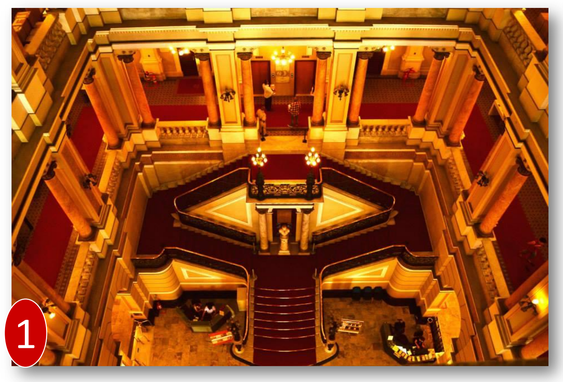
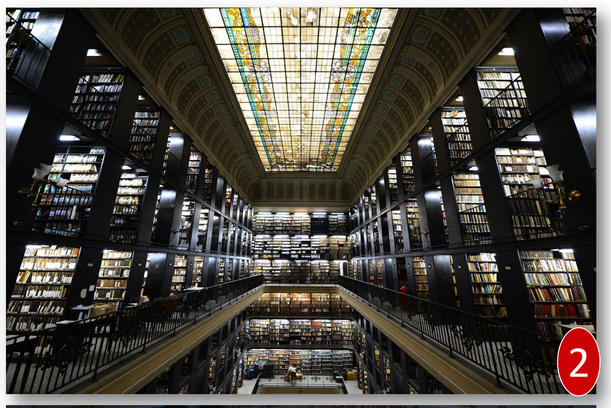
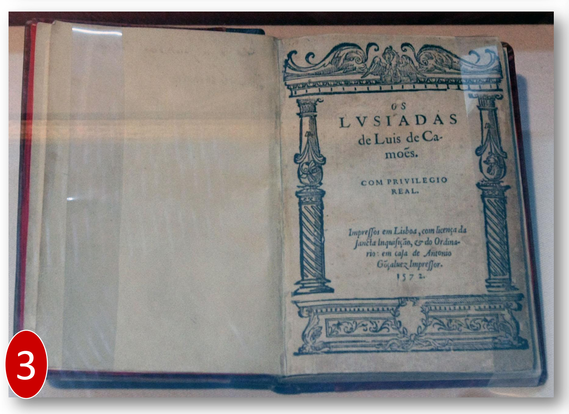
Introduction

Installed in 1910 at the central area of Rio de Janeiro city, the Brazilian National Library (BNL) has under its guard more than 9 million items comprising books, folders, manuscripts, engravings and maps. Included in the rare collection is the first edition of the Luís de Camões' epic work *Os Lusíadas*, published in 1584, and the Mazarin Bible of 1462, believed to be the second printed version of the Scripture and consequently considered to be among the most valuable books in the world. Preventive conservation is therefore the principal aim of this research.







Figures 1 and 2: entrance hall and bookshelves inside the BNL;
Figure 3: first edition of the Luís de Camões' epic work *Os Lusíadas*, published in 1584;
Figure 4: the Mazarin Bible of 1462, also known as the Gutenberg Bible.

Methodology

Seven different indoor and one outdoor sampling points were chosen considering collection's importance and microclimatic conditions which may cause deterioration of the materials.
The gaseous pollutants NO_x, SO_2, O_3, aldehydes, formaldehydes and BTEX were evaluated by means of passive diffusive sampling and their concentrations were determined by IC, UV-Vis Spectrophotometry and GC–MS. Multiple-wavelength AEs were employed for determination of Black Carbon in real time.

Results

The first analysis, referring to the period from 5 to 12 February 2014, provides preliminary results of BTEX and ozone. Indoor and outdoor average concentrations for benzene, toluene, ethylbenzene, *m,p*-xylene and *o*-xylene are respectively: 2,5 and 3,4 µg/m³; 22,1 and 19,5 µg/m³; 3,5 and 1,0 µg/m³; 5,0 and 4,9 µg/m³; 0,99 and 0,55 µg/m³. For ozone, the indoor and outdoor average concentrations are 0,92 and 5,97 µg/m³, respectively.

Figure 5: passive diffusive samplers in a exposition at Rare Works section.

Results are interpreted separately and as a whole with the specific aim of identifying compounds that could contribute to the chemical reactions taking place on the surfaces of artifacts and which could potentially cause irreversible damage to the artworks. The concentrations found in this study were lower than those found in the library of Jawaharlal Nehru University, New Delhi (Kumar et. al., 2013) and are similar to those found in The Oscar Niemeyer Museum, Curitiba (Godoi et. al., 2012).
Furthermore, toluene, ethylbenzene, *m,p*-xylene and *o*-xylene indoor/outdoor ratios showed that the pollution sources may come from indoors. Some materials can act as sources of some organic compounds, such as BTEX.
The ozone indoor concentration is much lower than outdoor, which can be due to high rates of deposition of O_3 or due to reactions with other pollutants in the indoor atmosphere of the library.

References

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Kumar, A.; Singh, B. P.; Punia, M.; Singh, D.; Kumar, K.; Jain, V. K. Assessment of indoor air concentrations of VOCs and their associated health risks in the library of Jawaharlal Nehru University, New Delhi. Environ Sci Pollut Res (2014) 21:2240–2248.

Acknowledgments: