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METHODOLOGY OF EVALUATION OF AIR QUALITY EFFECT ON LIBRARY AND ARCHIVAL COLLECTIONS

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The Ministry of Culture of the Czech Republic supports in the period 2011-15 project "Methodology of evaluation of air quality effect on library and archival collections". The project has been carried out in collaboration of three Institutions: the Institute of Chemical Process Fundamentals ASCR, National Archives, and National Library of the Czech Republic. The aims of this project are (i) development of evaluation methods for indoor air quality in libraries and archives, targeted at reduction of damages on library and archival collections caused by adverse effect of environment and (ii) gaining detailed knowledge of direct dependences between damage of library and archival collections and surrounding environment, leading to precautions reducing the adverse effects of deteriorated environment.

The initial part of the study includes interaction between indoor and outdoor environment, detailed characterisation of indoor pollutants, and their transport indoors. For this purpose advanced monitoring of the air quality has been carried out in four archives in the Czech Republic, representing different outdoor environments: Zlatá Koruna (rural), Třeboň (small town), Teplice (industrial area), and Prague (large city with traffic). The monitoring comprises gaseous pollutants SO₂, NO₂, O₃, HNO₃, NH₃, and formic and acetic acids measured both indoors and outdoors using passive dosimeters, and temporal and spatial variation of size-resolved indoor and outdoor particulate matter (PM). For this purpose a simple aerosol spectrometer for wide particle size range suitable for indoor application has been constructed. To determine size-resolved chemical composition of PM, airborne particles have been sampled using two Berner type low pressure impactors and/or PM1 and PM10 Leckel samplers. The chemical composition has included determination of water soluble inorganic ions (Ion Chromatography), elements (PIXE), and elemental and organic carbon (EC/OC, Total optical Transmittance). Further, accompanying parameters, such as ventilation rate, temperature, relative humidity, and presence of bioaerosols has been monitored. In addition corrosivity of indoor and outdoor environment has been determined using OnGuard instruments, Purafil, Ag, Au, Pb coupons, and EWO dosimeters.

Inherent part of the project is exposition of different materials to the indoor air, typical for libraries and archives. Samples included paper, cardboard, binding leather and parchment, pigments and binding agents, and photographic materials. Parallel to these measurements free deposition of indoor PM on Teflon and quartz filters with different orientation has been investigated. Another study included sampling of indoor PM1 and PM10 particles on Whatman filters that were later on artificially aged. The aim has been to determine if there is any degradation of cellulose, caused by fine PM. During the project identical incunabula stored in depositories with different quality of air has been also compared. For this purpose the non-destructive evaluation of material conditions using SurveNIR instrument has been performed. Efficiency of mechanical cleaning after application of dust particles on model samples of paper has been also investigated.

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