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The European Union (EU) directive “Energy performance of Buildings” stipulates that all new buildings must reduce their energy consumption by the end of 2020. In order to meet these demands, low-energy buildings are constructed. These buildings have airtight and energy efficient envelopes achieved with functional building materials such as age-resistant plastic films, insulation and different sealing products. Unfortunately, these building materials are known to contain significant amounts of man-made and industrial chemicals that could be released to the indoor environment and might also cause various health issues among the occupants.

In view of this, the indoor air quality (IAQ) and the occurrence of selected organic compounds were investigated in newly built low-energy preschools in order to evaluate whether the new building concept, low-energy housing, can have a negative effect to the indoor environment and the occupants. This was achieved by measuring IAQ parameters (indoor air temperature, relative humidity and particle size distribution) in combination with chemical analysis (CO₂, NO₂, aldehydes, volatile organic compounds (VOCs), brominated flame retardants (BFRs) and organophosphate flame retardants (OPFRs)) and emission testing of building materials.

The IAQ was satisfactory in all preschools. Interestingly, those preschools with environmental certification had lower concentrations of formaldehyde, VOCs, BFRs and OPFRs probably associated with the usage of environmentally friendly and low-emitting building materials, interior decorations and chemical products in order to receive these certifications. Emission tests showed that collected building materials only contributed to a small fraction of the measured indoor chemical levels. Furthermore, preliminary exposure risk estimation of the indoor chemical mixture showed potential health risks from some individual compounds, but this needs further investigation.

In conclusion, the comprehensive and unique study design presented in this thesis will contribute to the ongoing works toward a non-toxic environment, further development of the low-energy building concept and the legislative movement on limit values for chemical emissions from building materials.

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