

### **Research project objectives**

The main objective of the work carried out within the project is to know and evaluate the amount of emissions of BFRs compounds (mentioned in Table 1) from the elements of living room facilities, and in the longer term to determine whether and to what extent these emissions affect the quality of atmospheric air. Consideration will be given to samples of analytes taken from the gaseous phase (indoor air) and dust, originating from:

- 1) selected residential areas located in the Tri-City,
- 2) selected public places (offices, libraries, schools),
- 3) car cabins of vehicles moving across the Tri-City, and also
- 4) from selected polymeric materials, which are representative/characteristic for studied indoor environments. In addition, the project will also investigate samples of polymeric materials, air and dust from the electrical and electronic waste recycling points to determine the impact of BFRs emissions from the electronic waste on atmospheric air quality.

After determining the concentrations of BFRs in ambient air and road dust, the analytical information obtained from mentioned indoor environments (treated as potential sources of BFRs emission into the atmosphere) can be used to determine the BFRs emissions to the atmospheric air. Acquisition of multi-faceted analytical information will enable a comprehensive characterization of selected BFRs migration pathways from the indoor environments to the atmosphere.

An additional cognitive value of the project will be an attempt to assess human exposure to mentioned BFRs as a result of exposure in both indoor and outdoor environments. The exposure assessment for compounds from the BFRs group will be based on the determination of the content of these analytes in the human hair samples collected from the occupants of the premises. The selection of hair samples for examination is dictated by the fact that these samples are taken in a noninvasive way from humans.

### **Basic research carried out under the project. Reasons for undertaking this particular subject**

The chemicals from the BFRs group, which are the subject of research under the project, belong to xenobiotics whose level of content in different parts of the environment requires special control. The first step in the schema describing the BFRs migration pathways in the environment is the release of these compounds into the air. This fact proves the viability of BFRs monitoring in the gaseous phase due to the possibility of transporting pollutants present in the air to other elements of the environment.

The conclusions from the analysis of literature data clearly indicate that there is no information on the total measurement of atmospheric burden of BFRs at their first stage of migration into the environment, i.e. at the stage of emission from polymeric materials to the gaseous phase of enclosed spaces. Therefore, the effects of the proposed research will make an important contribution to the development of knowledge about the size of migration streams of BFR compounds from the indoor environment to atmospheric air, i.e., the impact of indoor emissions on atmospheric air quality can be determined.

The innovativeness of the proposed project is based on a comprehensive approach to the presentation of the characteristics of streams shaping atmospheric air quality in terms of BFRs concentrations. So far, no study has been performed on scale described in the proposal. Accurately determining the impact of BFRs emissions from the indoor environment to atmospheric air, taking into account all potential gaseous and condensate phase migration paths, may be an interesting addition to the knowledge of Tri-City atmospheric air quality.

The results of this study will allow developing new analytical procedures that take into account the analytical difficulties of BFRs determination and also the widen knowledge about the potential for migration, presence and levels of BFRs in the environment. In addition, due to the extension of research into the complete migration pathway: polymer - air - suspended matter; the information obtained will contribute to the development of knowledge about the occurrence and environmental fate of emerging pollutants. Undoubted benefits of the implementation of research demonstrate clearly that they have a basic character.

Determining the migration potential and estimating the exposure of the organism to BFRs, based on the BFRs analysis in the human hair samples, will certainly increase public awareness of BFRs prevalence in the environment and the potential of negative health effects of exposure to these substances. The knowledge gained can contribute to the dissemination of procedures for manufacturers to label the presence of BFRs in the equipment parts and, consequently, to more aware selection of this type of product by consumers.