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COMPARATIVE ANALYSIS OF THERMAL STABILITY OF BUILDING INSULATION MATERIALS

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Abstract

This study undertakes to characterize through thermal analysis in dynamic conditions a wide range of building materials used for various types of insulation and presents for the first time a comparative analysis of their thermal stability. To this effect, the dynamic thermal analysis TG/DTG was applied. The results show a degradation resulting in one, two or three stages after a complex mechanism, with different mass loss, depending on the structure and atmosphere in which the thermal decomposition took place. The series of thermal stability for the analyzed insulation materials were also obtained. Since, in Romania, the emphasis has been laid lately on insulating the old buildings erected under the communist regime, which requires the large-scale use of extruded polystyrene wallboards, and since most of the windows have been replaced with double glazed ones and the gaps between the window frame and the wall are filled with waterproof flexible polyurethane foams, the second part of our research focused on the analysis of the thermal decomposition of these types of insulation materials. The TG-FTIR-MS technique applied to **XPS1** polystyrene showed a high amount of styrene in the gas resulting from its thermal decomposition and traces of pentane frequently used as blowing agent. When we conducted thermal decomposition in the air, we found it released the following agents: carbon monoxide (which is predominant), carbon dioxide, styrene and benzene. Using differential scanning calorimetry the presence of hexabromocyclododecane (HBCD) used as flame retardant was noticed. The TG-MS-FTIR technique applied to the flexible polyurethane foam marked **Foams1** revealed the presence of carbon dioxide (which predominated), hydrogen cyanide, acetonitrile, hydrochloric acid, isocyanic acid and nitrogen monoxide in the gases released by its thermal decomposition in the air.

Keywords: insulation materials, polystyrene, polyurethane foams, TG-MS-FTIR, thermal stability

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