

## DETERMINATION OF SELECTED HAZARDOUS AIR POLLUTANTS GENERATED IN THE THERMAL DECOMPOSITION OF FURFURYL RESINS USED FOR MOLDING

### Summary

The aim of the thesis was to develop and validate method for determination of selected hazardous organic compound, released in gas form, during thermal decomposition, in temperature range from 500°C to 1300°C, of selected furan resins, their activators and molding sands with furan resins. Studies were conducted on specially designed and created laboratory work station for thermal decomposition of resins, hardeners and molding sands. The subject of the analysis were the following organic compounds:

- benzene, toluene, ethylbenzene, orto-, meta-, para-xylene,
- selected polycyclic aromatic hydrocarbons: naphthalene, acenaphthylene, acenaphthene, fluorene, phenanthrene, anthracene, fluoranthene, pyrene, benzo(a)anthracene, chrysene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, indeno(1,2,3-c,d)pyrene, dibenzo(a,h)anthracene, benzo(g,h,i)perylene.

Literature review connected with selected hazardous air pollutants and their sources in foundry industry was presented in theoretical part of the work. There were also presented determination methods of compounds from BTEX and PAH group as well as instrumental techniques for qualitative and quantitative analysis of these compounds emitted during thermal decomposition of some materials used for production molding sands. In the experimental part, the station for thermal decomposition of tested materials was made. Due to the wide range of organic compounds selected for research, the independent research methodology appropriate for the determination of BTEX and PAHs compounds was developed. Important part of the work was determination of optimal parameters for sample preparation. Research to define the time of the thermal decomposition process, the mass of used adsorbents and the amount of solvents required for the analyte extraction were carried out. There was evaluated chromatography quantitative method of analysis compounds from BTEX and PAHs group emitted during furan resin, their hardeners and molding sands thermal decomposition process. There was used gas chromatograph coupled with mass spectrometer

for quantitative analysis. Organic compounds present in the gases formed during thermal decomposition of the tested materials were identified by comparing their retention times with retention times of the same compounds in the standard solutions.

Additionally, the analyte identifying factor was its mass spectrum. There was made validation of the developed methodology by determination of its validation parameters: specificity/selectivity, repeatability, accuracy, applicability range, linearity as well as limits of detection and quantification. Usability of evaluated method was confirmed by its use for BTEX and PAHs compounds amount determination in gases emitted during thermal decomposition of furan resins, their hardeners and molding sands. Evaluated methods enables assessment of conditions for formation of BTEX and PAHs compounds during thermal decomposition of the materials used in foundry for molding sand preparation.