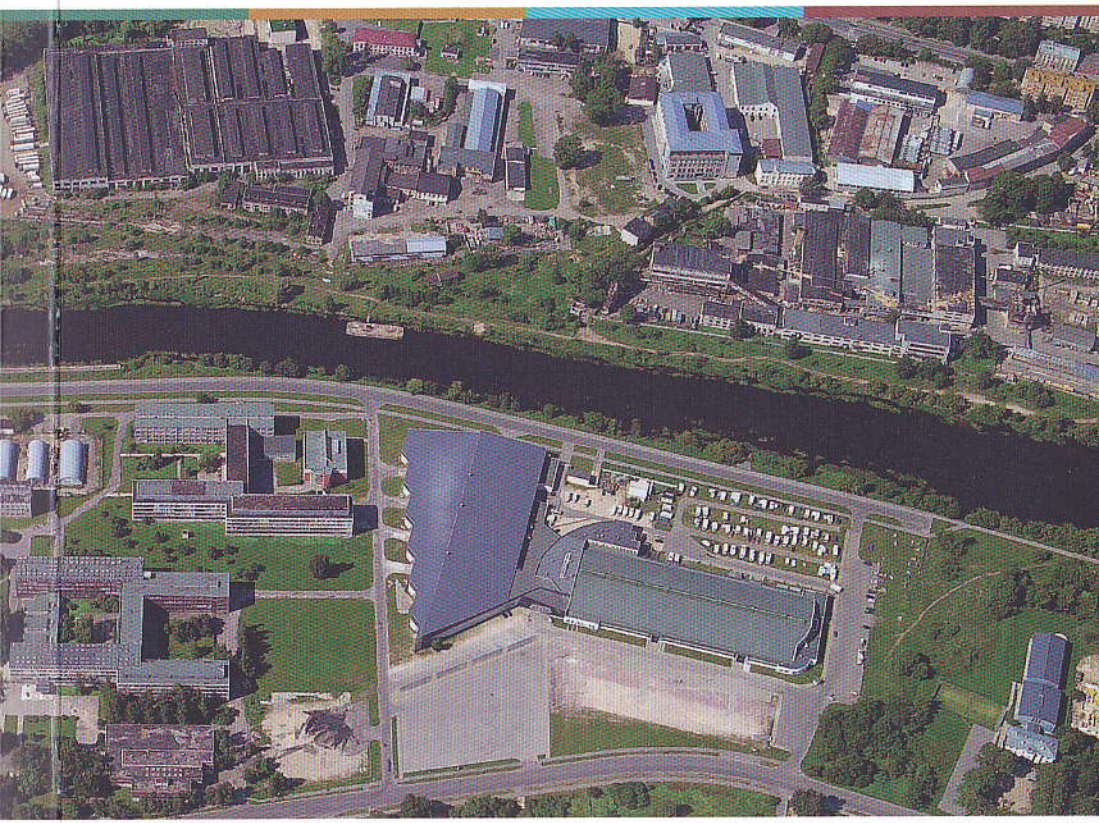
RIGA TECHNICAL UNIVERSITY
Faculty of Civil Engineering

2nd International Conference
Innovative Materials, Structures and Technologies

Book of Abstracts
Riga, Latvia, 30 September — 2 October 2015



Riga 2015

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COLOURED REACTIONS AND EMISSION OF ELECTRONS TOWARDS EARLY DIAGNOSTICS OF POLYMER MATERIALS OVERLOADING

ANDREY ANISKEVICH[1], OLGA BULDERBERGA[1], YURI DEKHTYAR[2], VIKTORIJA DENISOVA[3], KAMILA GRUSKEVICA[3], TALIS JUHNA[3], IGOR KOZAK[2], MARINA ROMANOVA[2]

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Fibre-reinforced composites with epoxy matrix and polymers are of wide applications in engineering.
The early undetected damage of these materials could be a reason of the constructions catastrophic destruction.
The polymer pipes (polyvinylchloride or polyethylene) have extensive applications in drinking water distribution systems. The polymer materials have a long lifetime and are not susceptible to corrosion, organic and inorganic additives being in use to improve material durability and lifetime. Polyethylene, polyvinylchloride and the above mentioned additives tend to leach biodegradable organic compounds. These compounds serve as a nutrient source for bacteria; they may react with disinfection agents (like chlorine, chloramine and ozone) and are capable to form carcinogenic substances, water organoleptic properties (taste and smell) are influenced. The leach could be promoted due to mechanical loading of the pipe (thermal and soil shift induced deformations, etc.). Therefore early diagnostics of the materials overload is of high importance in practical application.
The following approaches were employed towards early diagnostics of the materials overload: (1) coloured visualization of the overloaded area of the material; (2) detection of the emission of electrons as a result of loading of the material.
For coloured visualization the encapsulated leuco dyes and colour developer were used. Overloading ruptures, the capsules and dyes react with colour developer. Such a reaction develops the colour at the location of the overload. The embedded encapsulated components are well incorporated with the fibre reinforced composite with epoxy matrix. Because the overloading at the bulk of the material is invisible, only its surface layer is available for such diagnostics.
The detection of the electron emission was employed during the loading of both composites and polymers that are in use for water pipes.
The experiments were provided with the dog-bone shaped specimens. Both the coloured reaction and emission of electrons were detected for the loaded specimens *in situ*.

ACKNOWLEDGEMENT
The research leading to these results has received the funding from Latvia state research programme under grant agreement "INNOVATIVE MATERIALS AND SMART TECHNOLOGIES FOR ENVIRONMENTAL SAFETY, IMATEH".

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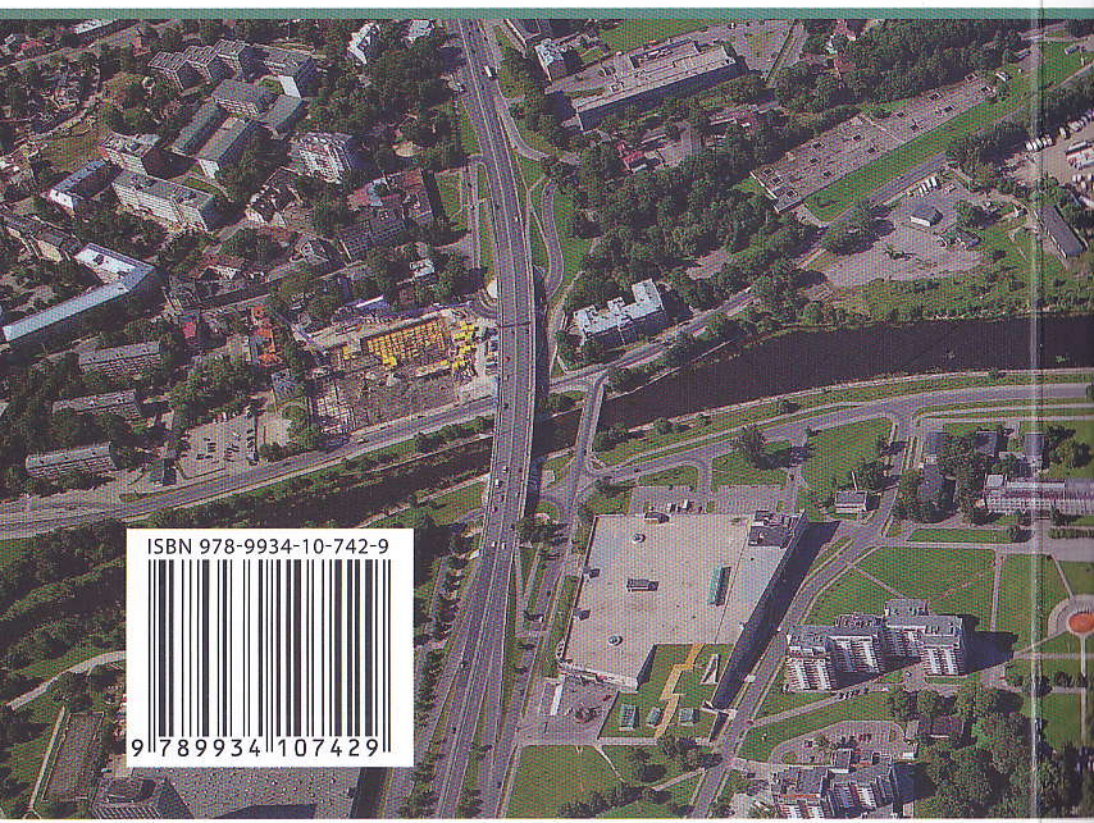

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