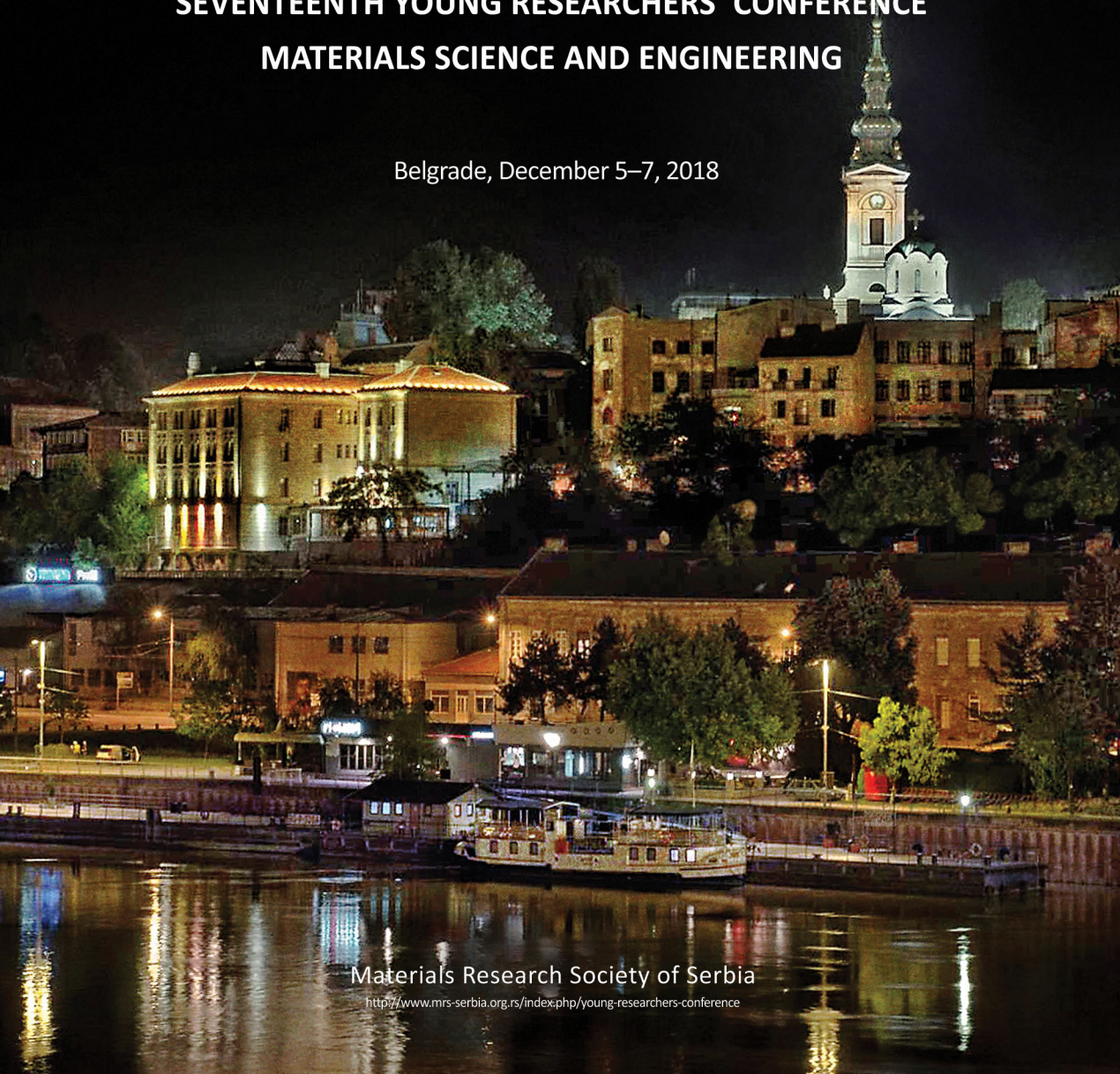
MATERIALS RESEARCH SOCIETY OF SERBIA
INSTITUTE OF TECHNICAL SCIENCES OF SASA

Programme and the Book of Abstracts

SEVENTEENTH YOUNG RESEARCHERS' CONFERENCE MATERIALS SCIENCE AND ENGINEERING

Belgrade, December 5–7, 2018



Materials Research Society of Serbia
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Aim of the Conference

Main aim of the conference is to enable young researchers (post-graduate, master or doctoral student, or a PhD holder younger than 35) working in the field of materials science and engineering, to meet their colleagues and exchange experiences about their research.

Topics

Biomaterials
Environmental science
Materials for high-technology applications
Nanostructured materials
New synthesis and processing methods
Theoretical modelling of materials

Scientific and Organizing Committee

5-6

The influence of the chemical modifications on the AC specific electrical conductivity of the jute woven fabrics

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In order to obtain jute fabrics with high AC specific electrical conductivity, the raw jute woven fabric was chemically modified. Namely, alkali modification with 17.5% NaOH at room temperature for 5 and 30 min was performed for progressive removal of hemicelluloses, while oxidative modification with 0.7% $NaClO_2$ at boiling temperature for 15 and 60 min was used for progressive removal of lignin. The chemical composition of the chemically modified jute fabrics was determined by successive removal of non-cellulosic components, after that, the α-cellulose remains as a solid residue. The moisture sorption was determined according to thermo-gravimetric method. As very important indirect indicator of the tendency of the fibrous materials to generate static charge, AC specific electrical conductivity was measured in the frequency region between 30 Hz and 140 kHz at 30% relative air humidity.

After the alkali modifications, the content of hemicelluloses decreased from 21.76% for unmodified to 12.34% for alkali modified jute fabric, while after the oxidative modifications, the content of lignin decreased from 13.48% for unmodified to 4.98% for oxidative modified jute fabric. The moisture sorption of the alkali modified jute fabrics is about 21.6-26.6% higher compared to the unmodified jute woven fabric. Oxidative modification of jute fabrics slightly increased their moisture sorption (3.2-12.5%). Since, the fabric is heterogeneous three-phase system, it was suggested to refer it as the capacitance of "fiber-moisture-air" system. In that context, the AC specific electrical conductivity is very sensitive to fabrics chemical composition and moisture sorption. The lowest AC specific electrical conductivity was noticed for the untreated jute fabric, which can be related to its highest content of hemicelluloses and lignin and the lowest moisture sorption. Chemically modified jute fabrics have higher values of AC specific electrical conductivity compared to unmodified jute fabric. For example, 36.6% lower content of hemicelluloses (modification with 17.5% NaOH for 5 min) in comparison with unmodified fabric resulted in increased value of AC specific electrical conductivity from 0.095 μSm^{-1} to 0.79 μSm^{-1} (at around 140 KHz). Jute fabric with 37.7% lower content of lignin has lower value of AC specific electrical conductivity (0.7 μSm^{-1}). The higher AC specific electrical conductivity of alkali modified jute woven fabrics can be explained by the presence of water in form of moisture, leading to increase the number of the polar groups, which facilitate the flow of current through the amorphous regions, as well as the crystallite's surface regions.

The obtained jute fabrics with higher AC specific electrical conductivity can be successfully used for protective clothes or textile of specific behavior in environments sensitive to