

Izvirni znanstveni članek *Original Scientific Paper*

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Parametri zbitega levo-desnega pletiva (2. del): moduli zanke in Mundenove konstante – zbita in superzbita struktura
Parameters of Compact Single Weft Knitted Structure (Part 2): Loop Modules and Munden Constants – Compact and Supercompact Structure

Temeljni cilj raziskave je bil primerjalno analizirati module zanke in Mundenove konstante levo-desnih pletiv iz oplaščenih prej z elastanskim jedrom ter iz konvencionalnih prej brez elastanskega jedra. Cilj je bil tudi eksperimentalno definirati module zanke in Mundenove konstante za pletiva zbite strukture. Preiskovana pletiva so bila izdelana iz viskoznih in poliakrilonitrilnih prej z vgrajenim elastanom in brez elastana. Napletena so bila v dveh gostotah ter suho oz. suho in mokro relaksirana (konsolidirana). Analizirane so bile vrednosti parametrov ohlapne, normalne in zbite strukture. Definirana je bila superzbita struktura pletiva.

Ključne besede: pletenje, pletena struktura, moduli zanke, Mundenove konstante, faktor kritja

The principal objective of the research was to comparatively analyse loop modules and Munden constants of single weft knitted fabrics made from core-spun yarns with elastane and those made from conventional yarns without elastane. An additional objective was to experimentally define loop modules and Munden constants for compact knitted structures. The investigated knitted structures were made from viscose and polyacrylonitrile yarns with incorporated elastane and without elastane, respectively. The samples were knitted in two densities, and dry, or dry and wet relaxed (consolidated). The values of the parameters of an open, normal and compact knitted structure were analysed. The supercompact knitted structure was defined.

Keywords: knitting, knitted structure, loop modules, Munden constants, cover factor

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Obdelava tekstilnih odpadnih voda z membranskim bioreaktorjem

Textile Wastewater Treatment with Membrane Bioreactor

Uporaba membranskega bioreaktorja (MBR), ki pomeni biološko razgradnjo odpadnih voda z aktivnim blatom v kombinaciji s fizikalnim procesom membranske filtracije, je postala zanimiva predvsem zaradi številnih prednosti pri čiščenju tekstilnih odpadnih voda in hitrega razvoja v zadnjem desetletju. Namen dela je bil očistiti modelno odpadno vodo z membranskim bioreaktorjem ter določiti njegovo učinkovitost čiščenja modelne tekstilne odpadne vode, pripravljene v laboratoriju po recepturi iz industrije. Cilj je bil vzpostaviti obratovalne razmere in stabilnost celotnega sistema, ki bi dal maksimalen izkoristek čiščenja z zeleno kakovostjo očiščene vode. S spremljanjem obratovalnih parametrov, kot so pretok vhodne odpadne vode, dovajanje kisika v biološki del obdelave ter spremljanje tlaka ultrafiltracije, smo nameravali zagotoviti optimalne obratovalne razmere. S fizikalno-kemijskimi analizami smo dokazali, da so se vrednosti KPK in koncentracije barvila, izražene kot spektralni absorpcijski koeficient (SAK), znižale, in sicer za 70 do 90 odstotkov. Iz rezultatov je razvidno, da je bila učinkovitost znižanja KPK okoli 90-odstotna, učinkovitost znižanja vsebnosti barvil pa doseže do 97 odstotkov. Iz navedenega lahko povzamemo, da je tehnologija MBR, ki je kombinacija biološkega in fizikalnega čiščenja, zelo učinkovita pri čiščenju tekstilne odpadne vode.

Ključne besede: reaktivna azobarvila, tekstilne odpadne vode, membranski bioreaktor, aktivno blato.

The use of a membrane bioreactor (MBR) has been rapidly developing over the last decade. This technology is based on the biodegradation of wastewater with activated sludge in a combination with the physical process of membrane filtration and has become of particular interest due to its numerous advantages during wastewater treatment. The objectives of this work were to treat laboratory-prepared wastewater using MBR, in order to determine its effectiveness regarding wastewater treatment, and to establish operational parameters and system stability which would provide optimum treatment. The operational parameters, e.g. inlet wastewater flow, concentration of oxygen within a bio-unit and the monitoring of ultrafiltration pressure, were adjusted during the treatment process. By measuring individual parameters and implementing the chemical analysis, a satisfactory functioning of the MBR system was demonstrated, since the efficiency value regarding COD reduction and the elimination of dyes, expressed as SAC (Spectral Absorption Coefficient), reached 70–90% for both parameters. The results show that the removal efficiency of COD was 90% and of the dyes 97%, respectively. It can be concluded that the

MBR technology, as a combination of biological and physical treatments, is very effective for the textile wastewater treatment.

Keywords: reactive azo dyes, membrane bioreactor, wastewater treatment, activated sludge

Izvirni znanstveni članek *Original Scientific Paper*

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Effect of Fibre Fineness on Colour and Reflectance Value of Dyed Filament Polyester Fabrics after Abrasion Process

Učinek finosti filamentov na barvne vrednosti in odbojnost svetlobe barvanih poliestrskih filamentnih tkanin po drgnjenju

Fineness is one of the most important properties of fibres constituting textile products. The aim of the research was to evaluate the effect of fibre fineness of multifilament weft yarns on the change in colour (ΔE) and reflectance factor (R-value) of dyed woven polyester fabrics before and after the abrasion process, which is one of the major phenomena affecting the use-life of a garment. The effect of filament fineness of weft yarns was assessed on samples with five different weft densities. The polyester yarns used were 150den/48filaments and 150den/144filaments. The abrasion was performed at 3000, 6000, 10000 and 15000 abrasion cycles.

The research showed that the fibre fineness of weft yarns affected the colour and reflectance factor of woven fabrics after the abrasion process. The woven fabrics with 150den/144f showed a greater change in the colour and reflectance factor at lower weft densities, while by increasing weft density, the trend was reversed. There were also some fluctuations in the reflectance value of samples at different numbers of abrasion cycles, which was a consequence of different sample surface characteristics after the abrasion process. The statistical evaluations using a three-way analysis of variance showed a significant effect of fibre fineness, weft density, and the number of abrasion cycles on the colour and reflectance factor of woven samples after the abrasion process.

Keywords: reflectance value, colour difference, weft density, polyester, multifilament yarn

Finost vlaken je ena najpomembnejših lastnosti vlaken. Namen raziskave je bil oceniti vpliv finosti filamentov multifilamentnega votka na spremembo v barvni vrednosti (ΔE) in na faktor odbojnosti svetlobe (R-vrednost) obarvanih poliestrskih tkanin pred in po postopku drgnjenja – pojav, ki pomembno vpliva na življenjsko dobo oblačil. Raziskano je bilo pet tkanin z različno gostoto votka. Uporabljena je bila poliestrska preja 150den/48f in 150den/144f. Drgnjenje je bilo izvedeno pri 3000, 6000, 10000 in 15000 ciklih. Izkazalo se je, da finost filamentov v votku vpliva na barvne vred-

nosti in faktor odbojnosti svetlobe tkanin po drgnjenju. Tkanine s 150den/144f so pokazale večjo spremembo pri nižjih gostotah votka, medtem ko je bilo s povečevanjem gostote obratno. Zaradi različnih površinskih lastnosti vzorcev po drgnjenju so se pojavljala nihanja v vrednosti odbojnosti svetlobe vzorcev pri različnem številu ciklov drgnjenja. Statistična obdelava s trisernom analizo variance je pokazala pomembnost vpliva finosti filamentov, gostote votka in števila ciklov drgnjenja na barvne vrednosti in faktor odbojnosti svetlobe tkanih vzorcev.

Ključne besede: odbojnost svetlobe, barvne vrednosti, gostota votka, poliester, multifilamentna preja

Strokovni članek *Professional Paper*

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Tekstilija kot navdih iz narave

Textiles as Inspiration from Nature

V članku je predstavljen tehnološki pomen sodobnih biomimetičnih tekstilij, ki so oblikovane s posnemanjem oblik in procesov iz narave. Posebna pozornost je namenjena samočistilnim lastnostim, ki jim pravimo lotosov efekt. Opisane so lastnosti površine lotosovega lista, ki zagotavljajo njegovo samočistilnost. Predstavljene so možnosti oblikovanja tekstilij z lotosovim učinkom pri postopkih kemijske apreture z uporabo tehnologije sol-gel. Navedene so prednosti apreture sol-gel pred konvencionalno. Predstavljeni so primeri priprave apreture sol-gel z lotosovim učinkom na bombažni tkanini, dobljene z uporabo prekurzorjev s superhidrofobnimi, oleofobnimi in protimikrobnimi lastnostmi. **Ključne besede:** biomimikrija, lotosov efekt, tekstilna vlakna, kemijska apretura, tehnologija sol-gel, superhidrofobnost, samočistilnost, protimikrobnost.

This paper presents the technological importance of novel biomimetic textiles prepared with mimicry forms and processes from nature. A special attention is devoted to the self-cleaning properties designated as the lotus effect. The properties of the leaf surface which enable a self-cleaning effect of the lotus are described. Moreover, the possibilities of preparing textiles with the lotus effect in the chemical finishing processes by using the sol-gel technology are presented. The advantages of the sol-gel finishing against conventional finishing are exposed. Examples of preparing sol-gel coatings with the lotus effect are presented on cotton woven fabrics using precursors with superhydrophobic, oleophobic and antimicrobial properties.

Keywords: biomimicry, lotus effect, textile fibres, chemical finishing, sol-gel technology, superhydrophobicity, self-cleaning, antimicrobial