Seznam publikací a výsledků oddělení 2015 - 2020
List of publications and results 2015 - 2020

Kolagen-kalcium fosfátové nanovrstvy s řízeným uvolňováním antibiotik pro ortopedické implantáty určené pro použití v případech známé infekce nebo pro prevenci jejího vzniku

Collagen-calcium phosphate nanolayers with controlled elution of antibiotics for orthopaedic implants to be used particularly in the case of known prosthetic joint infections or as a preventative procedure regarding primary joint replacement at a potentially infected site

Publikace/ Publications:

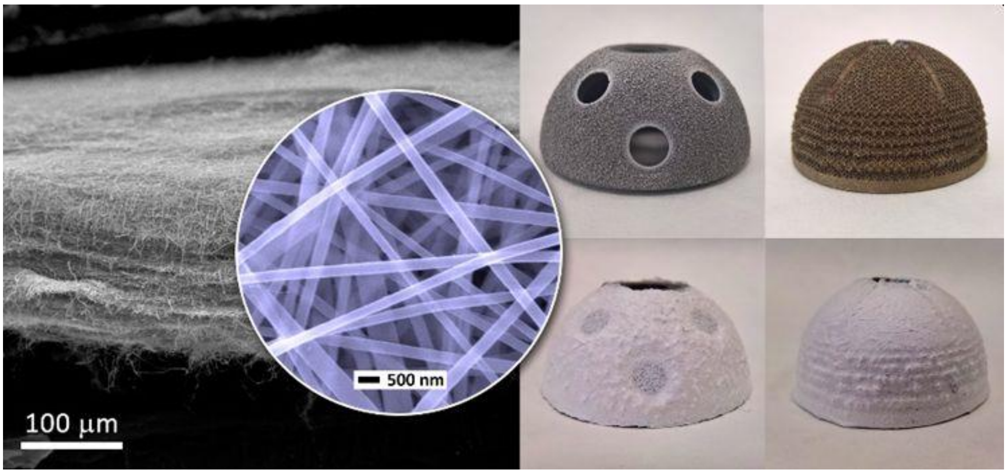
T. Suchý, M. Šupová, F. Denk, Š. Rýglová, M. Žaloudková, Z. Sucharda, R. Ballay, L. Horný, Z. Čejka, M. Pokorný, K. Knotková, V. Velebný. A nanocomposite layer on the basis of collagen nanofibers, and a method of preparation thereof. European Patent Office. Patent EP3311854. 2020-08-05.

T. Suchý, M. Šupová, P. Sauerová, M. Hubálek Kalbáčová, E. Klapková, M. Pokorný, L. Horný, J. Závora, R. Ballay, F. Denk, M. Sojka, L. Vištejnová, Evaluation of collagen/hydroxyapatite electrospun layers loaded with vancomycin, gentamicin and their combination: Comparison of release kinetics, antimicrobial activity and cytocompatibility, Eur. J. Pharm. Biopharm. 140 (2019) 50–59. DOI: 10.1016/j.ejpb.2019.04.021

T. Suchý, M. Šupová, E. Klapková, V. Adámková, J. Závora, M. Žaloudková, Š. Rýglová, R. Ballay, F. Denk, M. Pokorný, P. Sauerová, M. Hubálek Kalbáčová, L. Horný, J. Veselý, T. Voňavková, R. Průša, The release kinetics, antimicrobial activity and cytocompatibility of differently prepared collagen/hydroxyapatite/vancomycin layers: Microstructure vs. nanostructure., Eur. J. Pharm. Sci. 100 (2017) 219–229. DOI: 10.1016/j.ejps.2017.01.032

T. Suchý, M. Šupová, E. Klapková, L. Horný, Š. Rýglová, M. Žaloudková, M. Braun, Z. Sucharda, R. Ballay, J. Veselý, H. Chlup, F. Denk, The Sustainable Release of Vancomycin and Its Degradation Products From Nanostructured Collagen/Hydroxyapatite Composite Layers., J. Pharm. Sci. 105 (2016) 1288–1294. DOI: 10.1016/S0022-3549(15)00175-6

M. Pokorný, T. Suchý, A. Kotziánová, J. Klemeš, F. Denk, M. Šupová, Z. Sucharda, R. Sedláček, L. Horný, V. Králík, V. Velebný, Z. Čejka, Surface Treatment of Acetabular Cups with a Direct Deposition of a Composite Nanostructured Layer Using a High Electrostatic Field, Molecules 25 (2020) 1173. DOI: 10.3390/molecules25051173



Collagen-calcium phosphate nanolayers with controlled elution of antibiotics can be directly deposited on the surface of orthopaedic implants (titanium or 3D printed acetabular cups)

Izolace a charakterizace kolagenu a jeho potenciál pro biomedicínské aplikace
Isolation and characterization of collagen and its potential for biomedical applications

Publikace/ Publications:

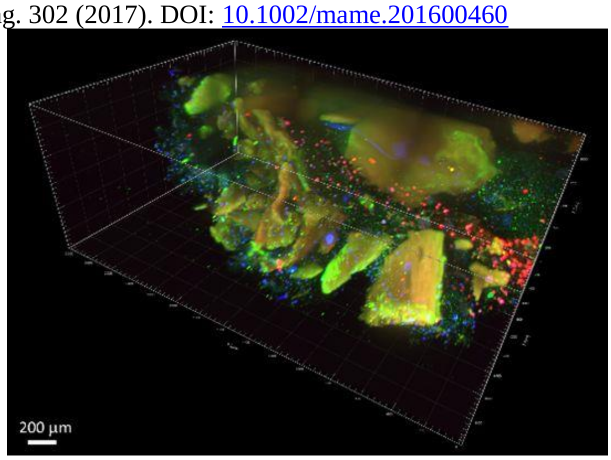
T. Suchý, M. Šupová, M. Bartoš, R. Sedláček, M. Piola, M. Soncini, G.B. Fiore, P. Sauerová, M. Hubálek Kalbáčová, Dry versus hydrated collagen scaffolds: are dry states representative of hydrated states?, J. Mater. Sci. Mater. Med. 29 (2018). DOI: 10.1007/s10856-017-6024-2

J. Horakova, P. Mikes, A. Saman, T. Svarcova, V. Jencova, T. Suchy, B. Heczkova, S. Jakubkova, J. Jirousova, R. Prochazkova, Comprehensive assessment of electrospun scaffolds hemocompatibility, Mater. Sci. Eng. C - Mater. Biol. Appl. 82 (2018). DOI: 10.1016/j.msec.2017.05.011

P. Sauerová, T. Suchý, M. Šupová, M. Bartoš, J. Klíma, J. Juhásová, S. Juhás, T. Kubíková, Z. Tonar, R. Sedláček, M. Piola, G.B. Fiore, M. Soncini, M. Hubálek Kalbáčová, Positive impact of dynamic seeding of mesenchymal stem cells on bone-like biodegradable scaffolds with increased content of calcium phosphate nanoparticles., Mol. Biol. Rep. 46 (2019) 4483–4500. DOI: 10.1007/s11033-019-04903-7

T. Suchý, M. Šupová, P. Sauerová, M. Verdánová, Z. Sucharda, Š. Rýglová, M. Žaloudková, R. Sedláček, M. Hubálek Kalbáčová, The effects of different cross-linking conditions on collagen-based nanocomposite scaffolds-an in vitro evaluation using mesenchymal stem cells., Biomed. Mater. 10 (2015) 65008. DOI: 10.1088/1748-6041/10/6/065008

Š. Rýglová, M. Braun, T. Suchý, Collagen and Its Modifications-Crucial Aspects with Concern to Its Processing and Analysis, Macromol. Mater. Eng. 302 (2017). DOI: 10.1002/mame.201600460



Adipose tissue-derived stem cells cultivated for 7 days in collagen gel reinforced with collagen electrospun particles. Cells are stained by specific anti-alpha-actin (red) and anti-calponin (green) antibodies. Cell nuclei are stained (blue) by DAPI (E. Filová, FGU CAS).

Izolace a charakterizace kostního minerálu a jeho potenciál pro biomedicínské aplikace
Isolation and characterization of bone mineral and its potential for biomedical applications

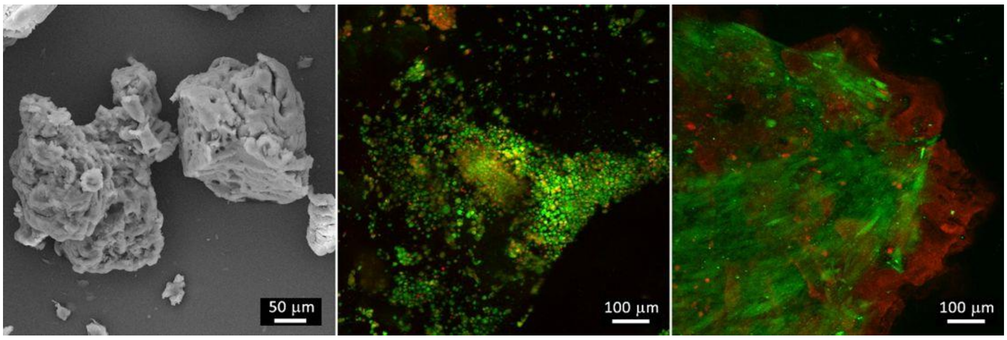
Publikace/ Publications:

M. Šupová, T. Suchý, Z. Sucharda, E. Filová, J.N.L.M. der Kinderen, M. Steinerová, L. Bačáková, G.S. Martynková, The comprehensive in vitro evaluation of eight different calcium phosphates: Significant parameters for cell behavior, J. Am. Ceram. Soc. 102 (2019) 2882–2904. DOI: 10.1111/jace.16110

T. Šmrhová, P. Junková, S. Kučková, T. Suchý, M. Šupová, Peptide mass mapping in bioapatites isolated from animal bones, J. Mater. Sci. Mater. Med. 31 (2020) 32. DOI: 10.1007/s10856-020-06371-z

Šupová M. The Significance and Utilisation of Biomimetic and Bioinspired Strategies in the Field of Biomedical Material Engineering: The Case of Calcium Phosphate-Protein Template Constructs. Materials 13 (2020) 327.

M. Šupová, Substituted hydroxyapatites for biomedical applications: A review, Ceram. Int. 41 (2015) 9203–9231. DOI: 10.1016/j.ceramint.2015.03.316



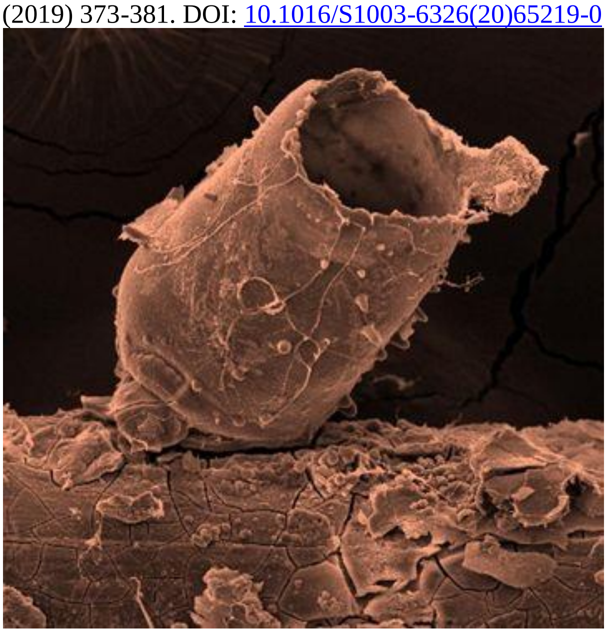
SEM image of bone mineral (bioapatite) particles isolated from human bone (left), human osteosarcoma cells (Saos2; middle) and human bone marrow-derived mesenchymal stromal cells (BM-hMSCs; right) cultivated for 14 days on polymer layers with bioapatite. Cells are stained by specific anti-alpha-actin (red) and anti-calponin (green) antibodies. Cell nuclei are stained by DAPI (blue), (L. Wolfová IEM CAS).

Biodegradabilní Mg dráty pokryté resorbovatelnými polymery pro biomedicínské aplikace
Biodegradable Mg wires covered by resorbable polymers for biomedical applications

Publikace/ Publications:

K. Tesař, K. Balík, Nucleation of corrosion products on H_2 bubbles: A problem for biodegradable magnesium implants?, Mater. Today 35 (2020) 195-196. DOI: [10.1016/j.mattod.2020.04.001](https://doi.org/10.1016/j.mattod.2020.04.001)

K. Tesař, K. Balík, Z. Sucharda, A. Jager, Direct extrusion of thin Mg wires for biomedical applications, Trans. Nonferrous Met. Soc. China 30 (2019) 373-381. DOI: [10.1016/S1003-6326(20)65219-0](https://doi.org/10.1016/S1003-6326(20)65219-0)



SEM image of a growing calcium orthophosphate tube on top of the commercially pure magnesium wire with a diameter of 250µm. This particular wire degraded for 48 hours in the cell cultivation media (alfaMEM) ([10.1016/j.mattod.2020.04.001](https://doi.org/10.1016/j.mattod.2020.04.001))

Pokročilé keramické pěny na bázi pyrolyzovaných polymerních prekurzorů
Advanced ceramic foams from a pyrolysed polymer precursors

Publikace/ Publications:

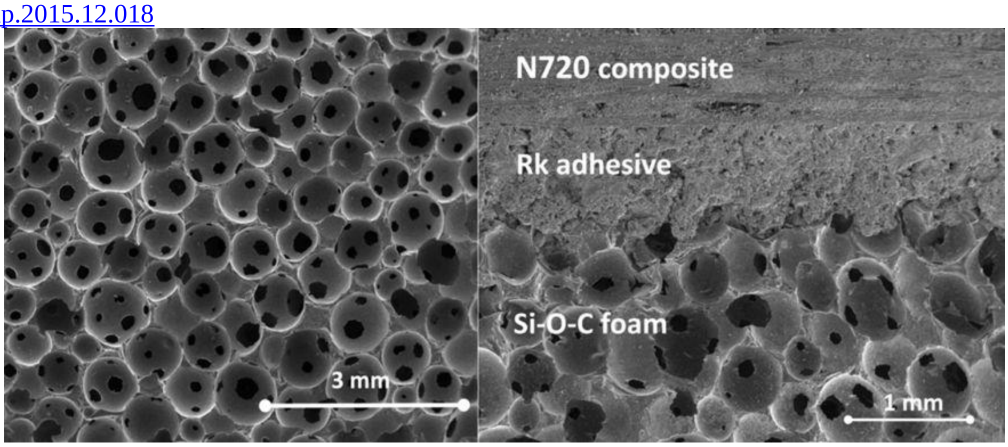
M. Cerny, Z. Chlup, A. Strachota, J. Schweigstillova, J. Svitilova, M. Halasova, Rheological behaviour and thermal dilation effects of alumino-silicate adhesives intended for joining of high-temperature resistant sandwich structures, J. Eur. Ceram. Soc. 37 (2017) 2209–2218. DOI: [10.1016/j.jeurceramsoc.2016.12.046](https://doi.org/10.1016/j.jeurceramsoc.2016.12.046)

M. Cerny, Z. Chlup, A. Strachota, M. Halasova, S. Ryglova, J. Schweigstillova, J. Svitilova, M. Havelcova, Changes in structure and in mechanical properties during the pyrolysis conversion of crosslinked polymethylsiloxane and polymethylphenylsiloxane resins to silicon oxycarbide glass, Ceram. Int. 41 (2015) 6237–6247. DOI: [10.1016/j.ceramint.2015.01.034](https://doi.org/10.1016/j.ceramint.2015.01.034)

M. Černý, Z. Chlup, A. Strachota, J. Svítilová, J. Schweigstillová, M. Halasová, Š. Rýglová, SiOC ceramic foams derived from polymethylphenylsiloxane precursor with starch as foaming agent, J. Eur. Ceram. Soc. 35 (2015) 3427–3436. DOI: 10.1016/j.jeurceramsoc.2015.04.032

Strachota, M. Cerny, Z. Chlup, K. Depa, M. Slouf, Z. Sucharda, Foaming of polysiloxane resins with ethanol: A new route to pyrolytic macrocellular SiOC foams, Ceram. Int. 41 (2015) 13561–13571. DOI: 10.1016/j.ceramint.2015.07.151

M. Havelcova, A. Strachota, M. Cerny, Z. Sucharda, M. Slouf, Effect of the dimethylsilyloxy co-monomer “D” on the chemistry of polysiloxane pyrolysis to SiOC, J. Anal. Appl. Pyrolysis. 117 (2016) 30–45. DOI: 10.1016/j.jaap.2015.12.018



Si-O-C ceramic foam prepared from preceramic polymer (left); application of Si-O-C foam as a lightweight core of all-ceramic sandwich with increased temperature resistance (right).

Hybridní kompozity připravené částečnou pyrolýzou
Hybrid composites made by partial pyrolysis

Publikace/ Publications:

M. Černý, M. Halasová, J. Schwaigstillová, A. Strachota, Š. Rýglová, Mechanical properties of partially pyrolysed composites with plain weave basalt fibre reinforcement, Ceram. Int., 40(2014) 7507-7521. DOI: 10.1016/j.ceramint.2013.12.102

M. Cerny, Z. Chlup, A. Strachota, J. Svitilova, Potential of glass, basalt or carbon fibres for reinforcement of partially pyrolyzed composites with improved temperature and fire resistance, Ceram. – Silik. 64(2020) 64. DOI: 10.13168/CS.2019.0056

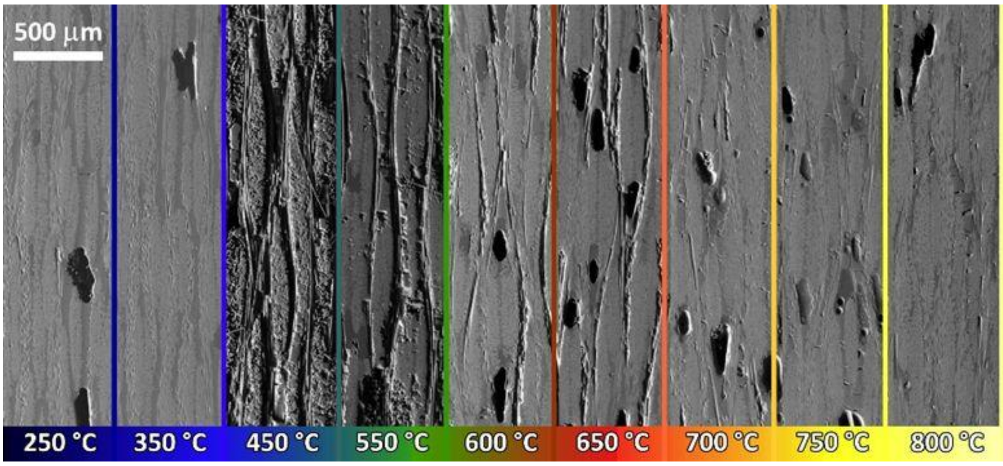
Z. Chlup, M. Cerny, A. Strachota, H. Hadraba, P. Kacha, M. Halasova, Effect of the exposition temperature on the behaviour of partially pyrolysed hybrid basalt fibre composites, Compos. Part B Eng. 147 (2018) 122–127. DOI: 10.1016/j.compositesb.2018.04.021

M. Halasová, M. Černý, A. Strachota, Z. Chlup, I. Dlouhý, Fracture response of SiOC-based composites on dynamic loading, J. Compos. Mater. 50 (2015) 1547–1554. DOI: 10.1177/0021998315594682

A. Strachota, M. Cerny, Z. Chlup, M. Slouf, J. Brus, J. Plestil, Z. Sucharda, M. Havelcova, M. Halasova, Preparation of silicon oxynitrocarbide (SiONC) and of its ceramic-fibre-composites via hydrosilylation/radical polymerization/pyrolysis, J. Non. Cryst. Solids. 423 (2015) 9–17. DOI: 10.1016/j.jnoncrysol.2015.05.019

A. Strachota, M. Cerny, Z. Chlup, K. Rodzen, K. Depa, M. Halasova, M. Slouf, J. Schweigstillova, Preparation of finely macroporous SiOC foams with high mechanical properties and with hierarchical porosity via pyrolysis of a siloxane/epoxide composite, Ceram. Int. 41 (2015) 8402–8410. DOI: 10.1016/j.ceramint.2015.03.037

Z. Chlup, M. Cerny, A. Strachota, J. Svitilova, M. Halasova, Effect of ageing at 1200 degrees C in oxidative environment on the mechanical response of SiOC foams, Ceram. Int. 41 (2015) 9030–9034. DOI: 10.1016/j.ceramint.2015.03.273



Composite reinforced with basalt fibers and with a matrix in the hybrid state of polymer/ceramic conversion. The individual materials are indicated by the pyrolysis temperature with which they were prepared

Další významné publikace a výstupy. patenty
Further important publications and outputs, patents

Nanokompozitní vrstva na bázi kolagenových nanovláken a způsob její přípravy. Předmětem vynálezu je bioaktivní nanokompozitní vrstva připravená kombinací elektrospinningu a elektroblowingu kolagenového roztoku obsahujícího hydroxyapatitové nanočástice. Předmětem vynálezu je také metoda přípravy vrstvy a metoda depozice antibiotik zajišťující jejich efektivní uvolňování bez zvýšení cytotoxicity. Předmětem vynálezu jsou dále ortopedické a dentální implantáty na bázi kovů a jejich slitin, na které je tato vrstva elektrostaticky nanesena v kombinaci s vybranými antibiotiky. /**A nanocomposite layer on the basis of collagen nanofibers, and a method of preparation** . The subject of the invention is a bioactive nanocomposite layer prepared by the combination of electrospinning and electroblowing of a collagen solution comprising hydroxyapatite nanoparticles. The subject of this invention is also a method of production of said layer and a method of depositing antibiotics for a more effective releasing thereof without increasing the cytotoxicity. The subject of the invention also comprises orthopaedic and dental implants based on metal or metal alloys, electrostatically coated with said composite layer based on collagen nanofibers with integrated hydroxyapatite nanoparticles and an antibiotic or a combination of antibiotics.

Sendvičová kolagenní pěna s málo porézním jádrem a vysoce porézními okrajovými vrstvami pro řízené uvolňování aktivních láteky. Předmětem užitného vzoru je sendvičová kolagenní pěna s málo porézním jádrem a vysoce porézními okrajovými vrstvami pro řízené uvolňování aktivních látek sloužící ke krytí ran.
Sandwich collagen foam with low porous core and highly porous edge layers for controlled release of active substances. The subject of the utility model is sandwich collagen foam with low porous core and highly porous edge layers for controlled release of active substances used to cover wounds.

Nanostrukturovaná vysoce porézní kompozitní kolagenní pěna pro řízené uvolňování aktivních látek. Předmětem užitného vzoru je kompozitní pěna vyrobená z kolagenu typu I, izolovaného z kůže sladkovodních ryb, který je impregnovan antibiotiky vybranými ze skupiny zahrnující vankomycin, gentamicin, rifampicin, nitrofurantoin, nebo jejich kombinací. / **Nanostructured highly porous composite collagen foam for controlled release of active substances**. Utility model of composite foam is prepared from collagen type I isolated from the skin of freshwater fishes, which is impregnated with antibiotics selected from the group comprising vancomycin, gentamicin, rifampicin, nitrofurantoin, and the combinations there of.

Degradovatelná vysoce porézní kolagenní pěna pro řízené uvolňování aktivních látek . Předmětem technického řešení je degradovatelná vysoce porézní kolagenní pěna s hemostatickými účinky, řízenou dobou degradace a řízeným lokálním uvolňováním aktivních látek, například antibiotik. / **Degradable highly porous collagen foam for controlled release of active substances**. The subject of the technical solution is a degradable highly porous collagen foam with hemostatic effects, controlled degradation time and controlled local elution of active substances, for example antibiotics.

Další publikační činnost oddělení naleznete v ASEPu
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