# Project summary

Research goals planned of OI172018 project were focused toward investigation and improvement of procedures and materials applicable in efficient removal of genotoxic substances from environment: water streams, soil and food. Research was supposed to be focused on three main groups of genotoxic substances: heavy metal ions, organic compounds (chlorinated compounds, alkaloids and pharmaceutical active substances), and mycotoxins; as well as on adsorption or ion exchange, and then transformation into environmentally safe products. Solid systems, planned for investigations and subsequent procedures of adsorption, ion exchange and chemical transformation, encompass environmentally safe oxide materials with large adsorption capacities: natural minerals (clinoptilolite and bentonite), synthetic zeolites (MFI, BEA and FAU) as well as composite materials based on zeolite. By modification of solid oxide-based materials with long-chain organo-cations, in order to increase their ability to bond polar substances, it is possible to obtain materials suitable for adsorption of mycotoxins and pharmaceutical active substances. One part of the research is focused on obtaining physiologically acceptable materials that could be used as functionalized pharmaceutical excipients.

# Sažetak projekta

Istraživanja na projektu OI172018 usmerena su na izučavanje i postupaka i materijala primenjivih u efikasnom uklanjanju genotoksičnih supstanci koje dospevaju u okruženje: vodene tokove, zemljište i hranu. Planirano je da se istraživanja fokusiraju na tri glavne grupe genotoksičnih supstanci: jone teških metala, organska jedinjenja (hlorovana jedinjenja, alkaloide i farmaceutskih aktivne supstance) i mikotoksine; kao i na postupke koji obuhvataju adsorpciju ili jonsku izmenu, a potom i transformaciju u ekološki prihvatljive produkte. Čvrsti sistemi na kojima je planirano istraživanje i izvođenje planiranih postupaka adsorpcije, jonske izmene i hemijskih transformacija su oksidni materijali velikih adsorpcionih kapaciteta neškodljivi po životnu sredinu; prirodni minerali (klinoptilolit i bentonit), sintetički zeoliti (klasa MFI, BEA i FAU) kao i kompozitni materijali na bazi zeolita. Modifikacijom čvrstih materijala na bazi oksida dugolančanim organo-katjonima u cilju povećanje njihovih sposobnosti vezivanja polarnih supstanci moguće je dobiti materijale pogodne za adsorpciju mikotoksina i farmaceutskih aktivnih supstanci. Jedan deo istraživanja usmeren je na dobijanje fiziološki prihvatljivih materijala koji bi se mogli koristiti kao funkcionalizovani farmaceutski ekscipijensi.

# Selected results/ Odabrani rezultati

**Researsh papers published in the SCI journals**

**Odabrani naučni radovi objavljeni u časopisima sa SCI liste**

1. Krajišnik D, Daković A, Malenović A, Djekić Lj, Kragović M, Dobričić V, Milić J. An investigation of diclofenac sodium release from cetylpyridinium chloride-modified natural zeolite as a pharmaceutical excipient. Microporous and Mesoporous Materials 2013; 167: 94-101
2. Krajišnik D, Daković A, Malenović A, Milojević-Rakić M, Dondur V, Radulović Ž, Milić J. Investigation of adsorption and release of diclofenac sodium by modified zeolites composites. Applied Clay Science, 2013; 83–84: 322-26
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9. Bajuk-Bogdanović D, Jović A, Nedić Vasiljević [B,](https://www.sciencedirect.com/science/article/pii/S0921510717301885?via%3Dihub#!) Milojević Rakić M, Kragović M, Krajišnik D, Holclajtner-Antunović I, Dondur V. 12-Tungstophosphoric acid/BEA zeolite composites – Characterization and application for pesticide removal. Materials Science and Engineering B: Solid-State Materials for Advanced Technology 2017; 225: 60-67.
10. Janićijević J, Milić J, Čalija B, Micov A, Stepanović-Petrović R, Tomić M, Daković A, Dobričić V, Nedić Vasiljević, B., Krajišnik, D. Potentiation of the ibuprofen antihyperalgesic effect using inorganically functionalized diatomite. Journal of Materials Chemistry B 2018; 6(36): 5812-5822.

**Selescted chapters in thematic proceedings from international meetings**

**Odabrana poglavlja u monografijama/tematskim zbornicima sa međunarodnih skupova**

1. Milić J, Daković A, Krajišnik D. Modified natural zeolites-functional characterization and biopharmaceutical application, in: Tiwari, A., (Ed.), Advanced heathcare materials Co-published by John Wiley & Sons, Inc. Hoboken, New Jersey, and Scrivener Publishing LLC, Salem, Massachusetts, 2014; 361-403. DOI: 10.1002/9781118774205.ch10
2. Krajišnik D, Daković A, Janićijević J, Milić J. Natural and modified silica-based materials as carriers for NSAIDs, in: Čalija, B., (Ed.), Microsized and Nanosized Carriers for Nonsteroidal Anti-Inflammatory Drugs: Potential benefits and challenges. Elsevier, Cambridge, 2017; 31-67. DOI: 10.1016/B978-0-12-804017-1.00008-X