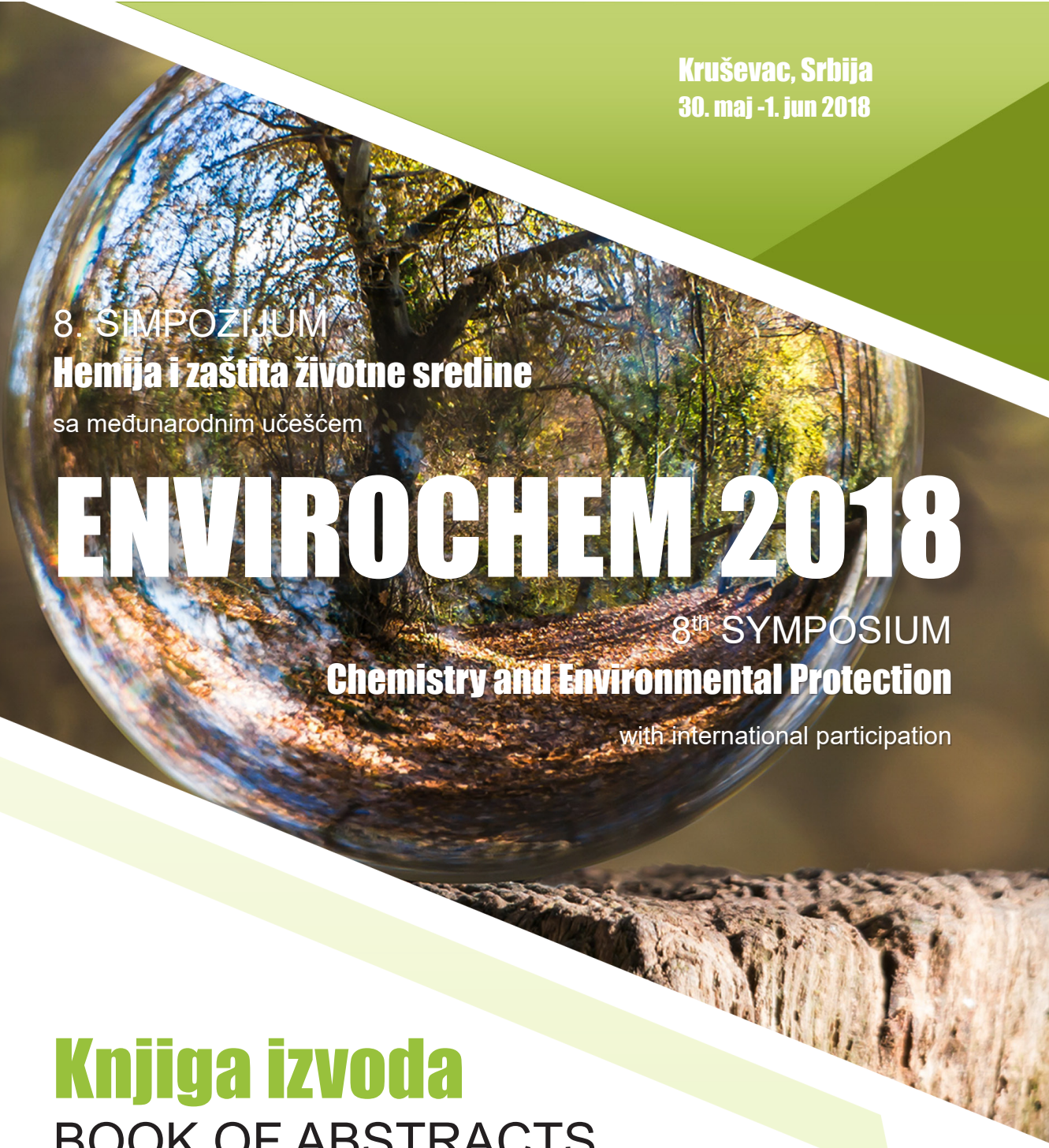

Kruševac, Srbija
30. maj -1. jun 2018

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sa međunarodnim učešćem

ENVIROCHEM 2018

8th SYMPOSIUM
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Knjiga izvoda
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Srpsko hemijsko društvo
Serbian Chemical Society

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Sekcija za hemiju i zaštitu životne sredine
Environmental Chemistry Division

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Exploring new horizons and sustainable technologies for highly efficient wastewater remediation and decontamination: Multifunctional biochar

Maja Turk Sekulić[1a], Tatjana Šolević Knudsen[2], Nikola Bošković[1], Đorđe Vukelić[1], Jasmina Kožar Logar[3], Jelena Radonić[1], Pap Sabolč[1,4]

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The occurrence of different toxic organic and inorganic contaminants in water is an environmental issue that must be addressed to avoid damage to ecosystems and human health. Inspired by this current issue, in this work, we have fabricated multifunctional biochar and activated carbons capable for highly efficient capture, identification and removal of toxic metals, radionuclides, emerging, priority and hazardous priority substances from water samples. To find facile, eco-friendly and cost-effective routes for developing multifunctional materials, which have the capability to resolve many of the challenges associated with wastewater problem, here, we report:

- The novel design and synthesis details of multifunctional biochar and activated carbons which precursors were lignocellulosic raw materials (sweet/sour cherry, apricot and plum kernels) as fruit processing industry waste [1];
- Characterization of multifunctional materials performed by elemental analysis, Scanning Electron Microscopy, Energy-dispersive X-ray Spectroscopy, Fourier Transform Infrared Spectroscopy and Brunauer, Emmett and Taller technique [2];
- Detailed evaluation of their capability for highly efficient separation of heavy metals ions (Pb^{2+}, Cd^{2+}, Ni^{2+}), chlorophenols, pharmaceutical compounds (sulfamethoxazole, carbamazepine, diclofenac, naproxen, ketoprofen and ibuprofen) and radionuclides;
- The batch studies performed by varying different process conditions: the initial pH of the water solution, adsorbent dosage, contact time, temperature and initial adsorbate concentrations;
- The time dependant adsorption results fitted to four diffusion and four reaction kinetic models;

- Equilibrium data fitted to three isotherm models (for better insight into the adsorption process);
- Calculated thermodynamic parameters of the process: Gibbs energy, enthalpy and entropy;
- The best conditions for achieving maximum efficiency of biochar, a carbon-rich low-cost by-product of naturally abundant waste biomass, which exhibits heterogeneous surface chemistry and strong binding affinity via oxygen-containing group on the surface [3];
- Desorption and regeneration study results;
- Two-stage CSTR reactor design for the real samples treatment;
- Eco-design of the multifunctional materials production process [4];
- Life cycle assessment, comparative adsorption study and cost analysis of the process [4].

Performed study showed encouraging results that are highly beneficial for the development of alternative wastewater management technologies, as well as for modern organic waste disposal solution. Fabricated multifunctional biochar and activated carbons were found to be a promising low-cost and eco-friendly solution for the removal of wide range of micropollutants from aqueous waste as part of sustainable technology involving slurry reactors.

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