RCH.P14 (Id: 633)
FABRICATION OF ANTIBACTERIAL FOAM DRESSING INCLUDING RADIATION ASSISTED SILVER-CARBON COMPOSITES

Oh Hyeong Kwon[*,a], Gwi Jae Kim[a], Won Ho Park[b], Donghwan Cho[a]

[a] *Kumoh National Institute of Technology, 61 Daehak-ro, Gumi 39177, South Korea,* [b] *Chungnam National University*
[*] *ohkwon@kumoh.ac.kr*

Dressings for human wounds have been aimed at protection, removal of exudate, inhibition of exogenous microorganism invasion, and improved appearance. Protection was accomplished by covering the wound with dressing materials. Wound areas that are kept just damp may heal faster, but accumulation of exudates under the dressing can cause infection. Silver is important in the treatment of wounds due to its anti-microbial properties, and commonly used in the treatment of major burn injuries where bacterial infection is common. Also, activated carbons are the most widely used industrial adsorbent for removing contaminants from gaseous, aqueous, and non-aqueous streams. We fabricated activated carbon powder by using radiation technology. We purified lignin from black liquor and then electron beam irradiated to stabilize lignin for carbonization.

Finally, we fabricated and characterized the functional polyurethane (PU) foams containing silver nanoparticles and activated carbon composites. Various PU foams containing Ag and AC composites were prepared and their cytotoxicity, anti-microbial activity, and in vivo wound healing ability were evaluated. Ag and AC composite particles were homogeneously dispersed in PU foams. In particular, PU foam had sufficient antimicrobial activity against two pathogenic bacteria and had good biocompatibility. PU foams showed effective wound healing compared to controls. It will be a useful approach as a functional wound dressing material.

RCH.P15 (Id: 607)
THE XPS STRUCTURE AND THE PECULIARITIES OF THE CHEMICAL BOND NATURE IN CeO_2

Konstantin Maslakov[a], Yury Teterin[b], Mikhail Ryzhkov[c], Alexej Popel[d], Anton Teterin[e], Kirill Ivanov[e], Artem Mitrofanov[*,f], Stepan Kalmykov[f], Vladimir Petrov[a], Peter Petrov[g], Ian Farnan[d]

[a] *Lomonosov Moscow State University,* [b] *Lomonosov Moscow State University/NRC "Kurchatov Institute", Moscow, Russia,* [c] *Institute of Solid State Chemistry, Ural Department of RAS, Ekaterinburg, Russia,* [d] *University of Cambridge, Downing Street, Cambridge, CB2 3EQ, United Kingdom,* [e] *NRC "Kurchatov Institute", Moscow, Russia,* [f] *Moscow State University,* [g] *Department of Materials and London Centre for Nanotechnology, Imperial College London, London, SW7 2AZ, United Kingdom*
[*] *mitrofjr@gmail.com*

Cerium dioxide is known as a non-radioactive structural substitute of actinide oxides (UO_2 and PuO_2). CeO_2-based ceramics is suggested as an inert ^{239}Pu or ^{235}U bearing matrix for nuclear fuel, as well as a matrix for high-level waste disposal. CeO_2 is also used an exhaust gas afterburning catalysts and in electronics.

X-ray photoelectron spectral structure of CeO_2 valence electrons in the binding energy range 0-∼50 eV was analyzed. The core-electron spectral structure parameters and relativistic discrete-variational calculation results for the CeO_8^{12-} (D4h) cluster reflecting cerium close environment were taken into account. Comparison of the valence and the core-electron spectral structures showed that formation of the inner (IVMO) and the outer (OVMO) valence molecular orbitals contributes to the spectral structure more than the many-body processes. The Ce 4f electrons were established to participate directly in the chemical bond formation in CeO_2 loosing partially their f nature. They were found to be localized mostly within the outer valence band. The Ce 5p atomic orbitals were shown to participate in the formation of both the inner and the outer valence molecular orbitals. A most of part in the IVMO formation is taken by the filled Ce 5p1/2,3/2 and O 2s atomic shells, while the Ce 5s electrons participate weakly in the chemical bond formation. The composition and the sequent order of the molecular orbitals in the binding energy range 0-∼50 eV was established. A quantitative scheme of the molecular orbitals for CeO_2 was built. This scheme is fundamental also for the interpretation of other X-ray spectra of CeO_2. Evaluations yielded that the IVMO electrons weaken by 37 % the chemical bond formed by the OVMO electrons.

The work was supported by the RFBR grant No. 17-03-00277a.