

Interview
of Dr. Yaroslav I. Korpan given to Prof. Claude Martelet for CMC2

Y.K. First of all I would like to thank you, Claude, for giving me a ground to present my thoughts and opinion in CMC2 concerning recent advances and prospects in micro and nanosensors research and development.

C.M. In your opinion, how do you see the future of chemical and biological microsensors?

Y.K. Taking into account a permanently growing number of publications and research groups working in this area, I would suggest a few close prospects on sensors R&D arena:

1. Research and development in the field will go down further on to the nano-sized transducers and recognition elements with a pronounced shift from microfluidic to nano-fluidic systems.
2. It will be a booming in application of different «omics» approaches in sensor platforms, especially in the field of diagnosis and prognosis of different diseases on early stages, such as cancer/tumor and neurodegeneration (Alzheimer, Parkinson's etc.). A special focus will also be on the molecular characterization of rare diseases in view of developing molecular diagnoses for a large number of undiagnosed rare diseases.
3. Fully-printed electronic and wearable platforms will be widely used for e-Health (including mobile phones) sensing. Multi-analyte, multivariate and multi-parametrical detection methodologies will be a new challenge in sensors R&D in the fields of food safety (foodstuffs adulteration), environmental monitoring (toxic compounds assays), sport (with a focus on contamination in sports supplements) and cosmetics (adulteration of cosmetic products).

C.M. Can you say us some words about your personal experience concerning micro/nanobiosensors for the diagnostic and emerging applications in this field?

Y.K. Just right now we are on the final stage of conducting experiments and knowledge exchanges which were financially supported by EU (FP 7 Program, # PIRSES-GA-2012-318053, "Micro/nanosensors for early cancer warning system - diagnostic and prognostic information") and NATO (Science for Peace Program, # SfP 984173, "Novel Electrochemical Nano-Sensors for Toxic Ions Detection"). During both projects accomplishment and in a tight cooperation with our colleagues from Ireland, Sweden, France, Portugal, Spain Romania, Egypt, Tunisia, South Africa and Morocco, we have developed several new micro/nanostructured bio/chemosensors for the detection of ammonium ions, urea, creatinine, L-Arginine, L- and D-Lactate, pyruvate, NADH, citrate, perchlorate, phosphate, chromate, interleukin 8 and 10 and activities of L-lactate dehydrogenase and superoxide dismutase. Special attention has also been paid to the development of flexible microfluidic Bio-Lab-on-a-Chip sensor platforms for electrochemical measurements and multi-array printed electrodes. I am very satisfied with the results and progress of these investigations as for the last 4 years we have published over 60 articles in highly-impacted peer-reviewed journals (Biosensors and Bioelectronics, Sensors and Actuators B, Microchimica Acta, IEEE, Bioelectrochemistry, Electroanalysis, Carbon etc), several book chapters, participated in more than 30 international conferences and organized 5 international workshops.

C.M. Can you give the CMC2 letter examples concerning your expertise about nano/micro chemical sensors for environmental and food-processing applications?

Y.K. We are still interested in and working on nano/micro sensors for environmental and food-processing applications. During recent years we have developed sensor prototypes for more than 20 compounds, including formaldehyde, carnitine, alkaloids, amino acids etc. In 2016, along with a group led by Prof. Constantinos Georgiou from Agricultural University of Athens (Greece) we obtained and started a new project under ERASMUS+ Program related to the development of analytical methodologies based on «elemental metabolomics» (introduced by Prof. Georgiou less than a month ago) for food authentication.

C.M. As you represent Ukraine, I would also like to have your overall opinion about the financial support of research in Ukraine.

Y.K. In my opinion, the situation with funds allocation for research is getting worse and worse. Of course, the main reason is that Ukraine is in the war with Russia since 2014 (announced or unannounced does not matter in this case) and a huge amount of country budget is re-distributed to support Ukrainian military forces. The beginning of 2016 was extremely disappointing time for the Ukrainian scientists because Government again cut down the basic financial support of research and we were forced (deliberately or not is quite questionable) to decrease the permanent staff at every research institution by 30-40% just to be able to pay only a salary to the remaining personnel. In 2016, we did not get any governmental funds for equipment, consumables, travels, heating, electricity, gas and water supply - in reality, the majority of Ukrainian research institutions are living in such conditions since the last World economic crisis. Can you imagine that the funds allocated to all Ukrainian research organizations are below 0.3% of country GDP (I would suppose some third countries have better financial support for R&D).

C.M. Are there any other explanations for such a complicated situation in science?

Y.K. There are a few reasons (my personal opinion):

1. Governmental white collars do not understand at all the difference between basic and applied science.
2. An attempt to combine artificially science existing in research institutions and universities is an absolutely wrong way for Ukraine. Research and educational systems have been established and developed in the parallel directions and are very sensitive to sharp perturbations (only gradual changes could be acceptable).
3. Young generation of politicians and managers looks rather like the accounting office workers than the well-educated people (despite the fact that some of them got diplomas from the well-known western universities).
4. Some Ministries (for example, Ministry of Education and Science, Youth and Sport of Ukraine) manage too many areas simultaneously and in reality, none of them are managed in a proper way separately.
5. Researchers are quite lazy and very often do not advertise (of course, in a layman manner) their results, developments and achievements and, consequently, are seriously criticized by the citizens of our country.

In any case, I am sure the research (like a show) must go on and we will survive despite any collisions, misunderstandings and temporary problems!