



## Preface

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The IAEA has been fostering and facilitating the development and deployment of nuclear and radiation technology applications as important components to deliver specific benefits to the global society, as well as to address specific priority needs of its Member States (MS). In this context, the Scientific Forum of the IAEA General Conference held in 2015 on the topic of, '*Atoms in Industry: Radiation Technology for Development*' showcased several such achievements and the vital role and contributions of IAEA. The Scientific Forum of the IAEA General Conference held in 2016 went a step further, highlighting the vital contributions of nuclear and radiation technologies towards achieving or attainment of a number of the seventeen Sustainable Development Goals (SDGs). In this backdrop, the IAEA organised an International Conference on Applications of Radiation Science and Technology (ICARST-2017), in Vienna during April 24–28, 2017, to provide an appropriate forum for objective review of the status as well as the recent advances and trends in the field.

A total of 501 persons, comprising 435 participants and 66 observers, coming from 73 MS, 4 organisations, and 44 industries, attended the ICARST-2017. There were 323 presentations in two parallel tracks – 174 oral presentations (invited talks and proffered papers), and 129 posters displayed. The first track dealt with radiation technology and radiation processing, and the second one covered radiation techniques' support to industrial processes and future energy systems. The ICARST-2017 Book of Abstracts brought out by the IAEA is accessible on the Conference web page at: <http://www-pub.iaea.org/iaeameetings/50814/International-Conference-on-Applications-of-Radiation-Science-and-Technology-ICARST-2017>.

The journal "Nukleonika" kindly offered to the IAEA to publish a Special Issue as 'Part-Proceedings of ICARST-2017'. The Authors of ICARST-2017 papers were hence encouraged to consider submitting their manuscripts for possible publication. "Nukleonika" Journal Office and the Guest Editor profusely acknowledge the overwhelming response of the authors and their interest to seek to publish their work in the Special Issue of "Nukleonika". The current issue of "Nukleonika" carries just nine articles, as typical examples of the importance of the field and achievements, out of the very large number of presentations made at ICARST-2017.

Radiation science and technologies are of high interest world-wide, as there are several established areas and

emerging applications, with most of them having high impact in health care, industry, environment, energy systems, cultural heritage, among others. Most of the radiation technology applications are predominantly meant for value addition and/or problem-solving. These applications can be broadly grouped into three types: (i) enhancing industrial productivity and safety; (ii) advanced ('designer-made') materials development for specific uses; and (iii) management of pollutants for environmental protection. Further sub-grouping, under each type as below, would help project them in the right perspective: (a) established large-scale applications; (b) proven and growing applications; (c) demonstrated applications, yet to enter large-scale use; (d) emerging applications or in development stage.

The event ICARST-2017 helped showcase almost all the advancements and achievements in the applications of radiation technologies, as well as the IAEA support to MS for their adoption and/or associated technology development. The IAEA through its Department of Nuclear Sciences and Applications (NA), is implementing programmes in various fields of nuclear applications and delivering benefits to its MS through fostering relevant developments in nuclear science and technology, as well as facilitate their transfer to interested MS, so as to contribute towards socio-economic development of the MS. In this context, NA avails of global experts' advice through the Standing Advisory Committee for Nuclear Applications (SAGNA). The IAEA's Coordinated Research Projects (CRP) is one of the major implementation mechanisms for exchange of knowledge and collaboration among participant MS drawn from different regions, and many of the presentations and posters at ICARST-2017 were based on CRP's results. In addition, the IAEA has been supporting over the years a number of its Member States, mostly through its Technical Cooperation (TC) Programme, in capacity building, HRD, establishing facilities, and adopting applications. Many recipients of IAEA support, who joined the ICARST-2017, had the opportunity to share their experience and benefit from fruitful deliberations and networking.

Industrial participation at the event also helped appreciate the recent development of radiation processing systems and associated equipment available for deployment. The bridging of science and industry at ICARST-2017 is deemed a good proof for the value-addition contributions of the radiation technology. Nurturing and fostering networking

among stakeholders, experts, researchers and students, industry and end-users, radiological safety regulators, and national policy makers, etc. are the hallmark of such events held by the IAEA and ICARST-2017 was no exception.

The editorial approach was to include a few typical success stories of different applications and certain associated technical developments from different regions of the world, and also covering as many streams of applications as possible. By applying these criteria, and the need to keep the publication in time as the 4<sup>th</sup> issue of the year 2017, a final selection of only nine papers has been possible in this issue, including one as a Technical Note. The resultant output is the current issue of the “Nukleonika” in the readers’ hands now.

The radiation-aided enhancement of the bio-active properties of chitosan extracts is the first paper. This is followed by two papers describing the European experience with the important role of radiation processing and associated radiation techniques in the preservation and authentication of cultural heritage. The final paper in this category deals with the research work focused on the development of a novel methodology to reduce excess nitrate in drinking water utilising radiation-grafted copolymer stabilised with zero-valent iron nanoparticles. The next set of papers deal with radiation-aided industrial process management in terms of trouble-shooting of process issues and/or evaluation of performance parameter. The first paper is on flow dynamics study of catalyst powder in catalytic cracking unit for troubleshooting, while the next one is on the use of gamma column scanning to assess rectifier column performance. Another paper deals with radiotracer investigation of industrial effluent treatment plant of a pulp-paper mill. The final paper in this category deals with the use of the ubiquitous radioisotope technetium-99m for various applications including sediment

transport studies. The practical experience of Morocco in upgrading their gamma irradiation facility with cobalt-60 in temporary pool, and also enhancing safety and control features, is captured in the final paper as Technical Note in this Special Issue.

There were far more submissions of manuscripts than what could be accommodated in a single Special Issue of the journal. All the manuscripts received in time for submission have gone through the standard review process, starting first at the Journal Office and Guest-Editor end. Rejection of many was inevitable due to inadequate strength of technical content/merit. Potentially sound manuscripts were sent for peer review to domain experts. Manuscripts receiving critical peer review reports were rejected, in line with the Journal policy. There were some papers on interesting basic work, modelling etc. and the authors of these papers have been requested to consider seeking their earlier submission to be taken up by “Nukleonika” for publication in a regular subsequent issue of the journal (in place of the current Special Issue).

I wish to acknowledge the IAEA’s Organising Team of ICARST-2017 led by Dr. Joao Osso Jr. and the three Scientific Secretaries of ICARST-2017, and the “Nukleonika” journal team led by Dr Andrzej Chmielewski, Editor-in-Chief, “Nukleonika”, for giving me the opportunity to play the role of Guest Editor for this Special Issue of ‘Part-Proceedings of ICARST-2017’. I compliment wholeheartedly the “Nukleonika” editorial office team for the efficient and enthusiastic manner in which they handled all the matters and correspondence for the Special Issue. It is heartening to learn that the IAEA plans to continue the ICARST as a quadrennial series event and the readers can look forward to ICARST-2021.

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Guest Editor*



Opening session of the Conference ICARST-2017. (From left) D. Yang (DDG TC IAEA), A. Malavasi (DDG NA IAEA), Y. Amano (DG IAEA), A. G. Chmielewski (DG INCT), J. A. Osso, Jr. (SH, Chairman of the Conference, IAEA).