



## Papers by Selected Lecturers at the 11th International Symposium on Non-thermal/Thermal Plasma Pollution Control Technology & Sustainable Energy (ISNTPT 11)

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The 11th International Symposium on Non-thermal/Thermal Plasma Pollution Control Technology and Sustainable Energy was held in Montegrotto Terme, Italy, July 1–5, 2018. The conference was organized by the Department of Chemical Sciences of the University of Padova under the leadership of Professor Cristina Paradisi and Professor Ester Marotta with collaboration from the Department of Physics and Astronomy (Prof. Alessandro Patelli) and the Department of Industrial Engineering (Dr. Renato Gobbo) of the same University.

The conference had 121 attendees from 23 countries giving 10 invited lectures, 58 oral contributions, 46 posters, and 2 technical communications. Topics included fundamentals and diagnostics of atmospheric discharge phenomena, modeling and simulation of atmospheric discharge treatment, combination of plasma with other technologies, plasma assisted combustion applications, electrostatics, fabrication of materials by plasma, bio-decontamination and biomedical applications, and applications in agriculture and food processing.

This symposium series began with the NATO Advanced Research Workshop on Non-Thermal Plasma Techniques for Pollution Control held in Cambridge University, England, September 21–25, 1992. This workshop was sponsored by the NATO Scientific and Environmental Affairs Division and several other companies and agencies from Italy, Japan, The Netherlands, UK, and USA. The conference was attended by many of the pioneers in the field of plasma applications to environmental issues and included significant work on both electron beams and electrical discharge processing. The proceedings of that meeting are still available and contain some very useful reviews of the technology and tools available up to that date [1, 2]. The Second meeting was held in Salvador, Brazil (1997), and the Third in Cheju Island Republic of Korea (2001). The focus of these early meetings was on the fundamental and applied aspects of non-thermal plasma

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with particular emphasis on pollution control including the treatment of volatile organic compounds, nitrogen oxides, and sulfur dioxide in gaseous emissions from power plants and industrial sources. Although electron beam work is still of significant interest in environmental applications for air and water pollution treatment, and we recommend continual comparison of the various advantages and disadvantages of the different technologies [3–7], after the first meeting, the primary focus was on electrical discharge plasma. Following these first meetings the title was also modified to include energy related topics due to the significant environmental role of energy technology; the meeting title was thus changed to Non-Thermal Plasma Technology for Pollution Control and Sustainable Energy Development. Later yet, “Thermal Plasma” was also added to the title. (Although even in the first meeting thermal arcs were considered in one contribution for solid and liquid waste treatment.)

Initially, the meeting was scheduled to occur every 4 years, but after the 4th conference held in Panama City Beach, Florida, USA (2004) the frequency was increased to every 2 years due to the continued interest by the community of researchers. The following meetings were: the 5th in Ile d’Oleron, France (2006), the 6th in Green Bay, Taipei, Taiwan (2008), the 7th in St. John’s Newfoundland, Canada (2010), the 8th in Camaret, France, 25–29th (2012), the 9th in Dalian, China (2014), and the 10th in Florianopolis, Brasil (2016).

This special issue of Plasma Chemistry and Plasma Processing includes a selection of contributions from the 11th Symposium made by the Journal Editors based upon quality and topical relevance. The work reflects some of the new areas of plasma technology for environmental applications since the original conference while maintaining some of the core areas that have developed with advances in diagnostic tools and plasma sources. While the first conference focused on gas phase treatment, the last conference and several of these selected papers address water treatment by plasma. The area of water treatment by plasma now includes the emerging and very persistent water pollutants such as perfluoro-surfactants (Mahyer et al. [8]) and insecticides (Tampieri et al. [9]). The paper by Patinglag et al. [10] also addresses water treatment using a microreactor and that by Su et al. [11] considers bacterial inactivation. While the emission of nitrogen oxides continues to be a significant air pollution issue [12], the community of plasma researchers has broadened its approach to the study of nitrogen oxides to include synthesizing such species in gas–liquid plasma with air/nitrogen/oxygen mixtures for biomedical and agricultural applications (Hoeben et al. [13], Pawlat et al. [14], and Wandell et al. [15]). Volatile organic compounds removal by gas phase plasma using dielectric barrier discharges is also of significant and continuing interest and here Brandenburg et al. [16] reports on the analysis of microdischarge formation in this system. Plasma combustion and plasma enhanced combustion (Filimonova et al. [17]), as well as H<sub>2</sub> formation from biosyngas (Hrycak et al. [18]) are important new topics not covered in the first meeting. Likewise, the combination of plasma with catalysts, which was not addressed in the first conference, has now been identified as an important area for the further development of plasma technology [19, 20] and Bouchoul et al. [21] presents work on dry gas reforming by plasma catalysis. The utilization of plasma technology for environmental and energy applications [22–29] continues to be of significant importance and the broadening of the applications to medical and agricultural areas has significant promise [30–33].

We believe you will enjoy the papers in this special issue and look forward to seeing you at the 12th Symposium (ISNTP-12) to be held June 28–July 2, 2020 in Sapporo Japan and organized by Akira Mizuno, Kuniko Urashima, Nozomi Takeuchi, and Hyun-Ha Kim.

In this special issue we also include tributes to recently departed colleagues who have made outstanding contributions to our field, Professor Riccardo d’Agostino, Professor Max

Goldman, and Dr. Pavel Sunka, who were memorialized at ISNTP-11, and Professor Jean-Louis Brisset.

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