Guest Editorial Special Issue on Dusty Plasmas

THIS SPECIAL Issue focuses on the field of dusty plasmas or also referred to as complex plasmas. Most of the papers were presented at the 8th International Conference on the Physics of Dusty Plasmas (8 ICPDP, Fig. 1), which was hosted by Charles University and held in Prague, Czech Republic, on May 20–25, 2017. We would like to join the continuous tradition of special issues of the IEEE TRANSACTIONS ON PLASMA SCIENCE from April 1994, 2001, 2004, 2007, 2010, 2013, and 2016 associated with the other most important triennial meeting for the community, the Workshop on the Physics of Dusty Plasmas. We believe that these two conferences and papers connected to them reflect the current state of the art and progress in the field.

It is well known that most of the mass in space is in the so-called plasma state, and this ionized matter coexists often with dust particles. The richness of interactions within this mixture results in a wide diversity of phenomena important for the formation of the universe. With time, the fundamental questions expanded from astrophysics further into laboratories as well as into industrial applications. A broad variety of topics addressed by the common names "dusty plasmas" or "complex plasmas" are illustrated by the conference program and partially by the contents of this special issue. If we look back to the aforementioned special "dusty" topics, we will see how much the field of dusty plasma physics evolved and penetrated into various other fields of physics. The number of it *in situ* (desired as well as undesired) space observations increases every day and complements to the overall picture of our dusty world addressing subjects such as the role of dust in the solar system, in the mesosphere, in the ionosphere, and on the atmosphere-free surfaces of asteroids and moons. The so-called plasma crystals provide fantastic models of strongly coupled systems and open a playground, e.g., for thermodynamics and statistical and colloidal physics. Studying dusty plasmas from all aspects, like dust crystal formation and its variations, generation and propagation of nonlinear waves, systems in strong magnetic fields, or under microgravity, and many other dust interactions attracts theoreticians to describe experimental observations. Fusion and industrial plasmas are, on the other hand, sensitive to the dust presence that can spoil the outcome, and thus, removal or at least exact control of dust seems to be a current issue.

As already noted, this is the first time that the papers from the ICPDP are published in a special issue of the IEEE TRANSACTIONS ON PLASMA SCIENCE, but more opportunities to make the dusty research visible for the scientific community were offered to the participants. Besides the traditional *AIP Conference Proceeding* (vol. 1925, 2018, containing 30 papers), "space" participants were encouraged to join a special issue of the journal *Planetary and Space Science* devoted to "Dust, Atmosphere, and Plasma Environment of the Moon and Small Bodies" and about five papers were submitted there. This Special Issue contains 25 contributions (a few more papers were rejected within the review process) and thus represents only a portion of discussed topics.

Fig. 1. The logo of the 8th International Conference on the Physics of Dusty Plasmas (8 ICPDP).

The "Prague" conference attracted 166 participants from 25 countries around the world, including many students and young researchers who reported new results. There is no doubt that the community will continue expanding and that dusty plasma topics will find new and exciting applications in the future and will also penetrate to other fields providing new insights into the observed phenomena.

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