Eur. Phys. J. E (2020) **43**: 4
DOI 10.1140/epje/i2020-11929-0

THE EUROPEAN PHYSICAL JOURNAL E

Editorial

Topical Issue on Dielectric Spectroscopy Applied to Soft Matter

Published online: 23 January 2020 –

Broadband Dielectric spectroscopy (BDS) is a well-established experimental technique, successfully employed to characterize soft matter at the molecular level. The technique is currently used to investigate phase transitions, molecular relaxation processes and conduction phenomena of polar and nonpolar molecules over a large frequency range in both bulk and confined geometries, *e.g.* nanopores, single polymer coils, nanocomposites and freestanding membranes. Due to its extremely high sensitivity to changes in dipole moment, this spectroscopic approach can also be efficiently used to monitor chemical reactions, characterize biological materials and improve the stability of pharmaceutical compounds.

In the last decade, the interest towards this experimental method has steadily grown and the number of citations to papers mentioning BDS has more than doubled. In addition to the official meetings of the International Dielectric Society which take place every two years (the latest in Brussels in August 2018, the upcoming in San Sebastián in September 2020), sessions on BDS are regularly organized within international conferences —*e.g.* at the APS March Meeting 2019 in Boston, ACS Spring Meeting 2020 in Philadelphia.

In this Topical Issue, we publish papers addressing the most recent advancements of BDS at an experimental level and on novel theoretical frameworks rationalizing dielectric relaxation phenomena. I would like to personally thank the whole editorial team of *The European Physical Journal E* for their invaluable support while handling these manuscripts.

This collection presents the investigation of different forms of soft matter via dielectric spectroscopy. Focusing on macromolecular systems, BDS has been employed, here, as an innovative tool to assess the outcome of polymer synthesis, by validating architectural features [1], to characterize with nanometric precision the spatially heterogeneous structure of polymer blends [2], to investigate the relaxation behavior and crystallization of novel bio-based aliphatic-aromatic block copolymers [3], to study association mechanisms and limitations of these H-bonding polymers [4], to understand the occurrence of fast chain dynamics of polymers under extreme geometrical confinement [5], and to elucidate the role of solution filtering in the preparation of thin polymer films [6]. Dealing with smaller molecules, BDS has been combined with NMR to study the dynamics of asymmetric binary glass formers [7]. Addressing the response of materials of biological interest, in this Topical Issue the dynamics of water in gelatin, hydrogels [8] and lipid bilayers [9] has been characterized over a tremendously large frequency range extending from the sub-Hz to the terahertz regions. On top of that, BDS has been employed to understand the complex phase diagram of a chiral nematic liquid crystal, presenting several relaxation processes [10]. This issue contains also papers on models providing a robust physical picture for the outcome of dielectric experiments. The *cooperative free volume rate model* permits rationalization of the pressure-dependent dynamics of glass-forming liquids and polymer melts [11], while *scaling approaches* allow the understanding of peculiar patterns in the behavior of polar-polar liquid mixtures [12].

I am confident that these outstanding contributions will stimulate fruitful discussion within the dielectric community and among the wider family of researchers investigating soft matter.

Simone Napolitano
Guest Editor

References

1. D.E. Martínez-Tong, J. Ochs, F. Barroso-Bujans, A. Alegria, Eur. Phys. J. E **42**, 93 (2019).
2. P. Szymoniak, M. Gawek, S. Madkour, A. Schönhals, Eur. Phys. J. E **42**, 101 (2019).
3. I. Irska, A. Linares, E. Piesowicz, S. Paszkiewicz, Z. Rosłaniec, A. Nogales, T.A. Ezquerra, Eur. Phys. J. E **42**, 107 (2019).
4. M. Tress, K. Xing, S. Ge, P. Cao, T. Saito, A. Sokolov, Eur. Phys. J. E **42**, 133 (2019).
5. T. Kinsey, E. Mapesa, T. Cosby, Y. He, K. Hong, Y. Wang, C. Iacob, J. Sangoro, Eur. Phys. J. E **42**, 137 (2019).
6. A. Debot, P. Tripathi, S. Napolitano, Eur. Phys. J. E **42**, 102 (2019).
7. Th. Körber, R. Minikejew, B. Pötzschner, D. Bock, E.A. Rössler,Eur. Phys. J. E **42**, 143 (2019).
8. S. Kripotou, K. Zafeiris, M. Culebras-Martínez, G. Gallego Ferrer, A. Kyritsis, Eur. Phys. J. E **42**, 109 (2019).
9. Y. Kadomura, N. Yamamoto, K. Tominaga, Eur. Phys. J. E **42**, 139 (2019).
10. M. Jasiurkowska-Delaporte, T. Rozwadowski, E. Juszyńska-Gałązka, J. Krawczyk, E. Dmochowska, P. Kula, M. Massalska-Arodź, Eur. Phys. J. E **42**, 121 (2019).
11. R.P. White, J.E.G. Lipson, Eur. Phys. J. E **42**, 100 (2019).
12. P. Losada-Pérez, Eur. Phys. J. E **42**, 110 (2019).