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Editorial

Special Issue on IWPMA (International Workshop on Piezoelectric Materials and Applications in Actuators) 2019

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Initially triggered more than a decade ago by a fruitful German–Korean collaboration, the International Workshop on Piezoelectric Materials and Applications in Actuators has rapidly reached international levels thanks to a strong community making the conference series one of the most recognized in the field. As a true multidisciplinary field without any frontiers, the conference locations also span the globe.

Research on piezoelectric materials and devices has seen many changes, ranging from sonar to MEMS, for instance, and has faced challenges that the community has always overcome, but its value has never been questioned and has even been growing, due to increasing demands in the energy field. The field is also exceptional as, in essence, it encompasses multidomain and transdisciplinary aspects, ranging from material synthesis to mechanics and electrical engineering, making the study of piezoelectric systems an exciting area with a wide range of topics. It also includes a broad investigation domain, from fundamental physics to applied research, covering a large TRL area where it is possible to meet people with different expertise and skills. Hence, in a world where a global approach is crucial, the piezoelectric research and applications community is definitely ahead of its time.

This Special Issue related to IWPMA 2019 is thus a showcase of this commitment in such an exciting field. The associated research ranges from materials and device design, such as efficient transducer arrays ([1]), to device development, for example, in terms of lightweight ultrasonic motors able to provide high torque without generating electromagnetic interferences thanks to a large aperture ([2]), cross-shaped design ([3]) or conical design ([4]). These advances make it possible to meet current industrial requirements, involving innovations such as underwater actuation for robot propulsion using a dual rotor mechanism ([5]) or a micro-aerial vehicles with ultrasonic motor-driven flapping wings ([6]). Combined with precise metrological methods, for instance optical positioning ([7]), these advances open up new application fields.

In addition to actuation, the applicability of multiphysically coupled materials and devices also includes energy harvesting, where some of the ambient energy is converted into useable electricity for a variety of uses, for instance, remote sensors. Regarding vibrational energy as a source, recent trends have shown that there is a strong interest in tuning potential wells to create nonlinearities in the device ([8]).

The combined and coupled nature of such materials and devices allows the development and integration of new functions which answer socio-economical stakes, with various outcomes, for example, efficient non-destructive testing methods for increased safety ([9]) or a better understanding of environmental coupling effects in surgical devices for better healthcare ([10]).

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