

2nd International Conference and Exhibition on **Mechanical & Aerospace Engineering** September 08-10, 2014 Hilton Philadelphia Airport, USA

Aqueous processing of functional ceramics relevant for electro-mechanical and aerospace engineering applications

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Acoustic and ultrasonic devices developed over the past 50 years have proven to be useful for a number of applications including remote, non-contact detection of radiation embrittlement of metals, monitoring of structures like railroad rails and wheels, bridges, machinery, etc., and for non-destructive testing of materials and components under several hazardous environments. Air-coupled and liquid-coupled inspection configuration systems provide non-contact generation and detection wireless sensor networks that are of high relevance in Mechanical & Aerospace Engineering fields since they enable Aerospace and terrestrial vehicles and other machines to report on their health and fatigue. Ultrasonic devices require components with dimensional features that decrease with increasing the required generation and detection frequencies. The state of the art micro-machining technologies to fabricate such functional components are onerous and time consuming. Therefore, finding alternative cost effective technologies is of crucial importance to fabricate ceramic micro components such as Micro Electro Mechanical Systems (MEMS). The present communication reports on the challenging aqueous processing of different electroceramics, including ferroelectric alkaline earth titanates and lead free piezoelectric powder materials, which tend to undergo hydrolysis reactions in contact with water. The passivation of the powder particles towards hydrolysis through a suitable surface treatment is the key point for a successful aqueous processing. On the other hand, the consolidation of micro components with high aspect ratios from colloidal suspensions is also challenging. Examples of piezoelectric pillar arrays for high-frequency transducers that work at frequencies up to 70 MHz will be presented.

Biography

José M F Ferreira is Associate Professor at University of Aveiro, Portugal, Department of Ceramics and Glass engineering, CICECO where he has completed his PhD in 1993. He is the leader of the Advanced Ceramics Processing Group. In his scientific career, he registered 15 patents and published more than 430 articles in SCI journals. He is Member of the World Academy of Ceramics and of the American Ceramic Society and Associate Editor of *The Journal of American Ceramic Society*.

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