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Smart nano composite paint sensors for infrared detecting and energy harvesting

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Functionality of nano composite Paint/PLZT films for use in pyroelectric infrared sensors and piezoelectric energy harvesting devices is presented. Smart Paint/Lead Lanthanum Zirconate Titanate (Paint/PLZT) nanocomposite films have been fabricated by the conventional paint-brushing technique on copper substrate. The pyroelectric and dielectric properties of the composite films were measured for their use in uncooled infrared detectors and thermal energy conversion devices. The properties investigated include: dielectric constants (ϵ' and ϵ''); pyro electric coefficient (p); and conductivity as a function of temperature. From the foregoing parameters, material's *figure-of-merits*, for infrared detection and thermal energy conversion, were calculated. The results indicated that composite films are functional and *figure-of-merits* increase with increase in amount of PLZT nanoparticles in paint. Based on the preliminary results obtained, it was found that the Paint/PLZT films are attractive for use in un-cooled thermal sensing elements and thermal energy conversion devices, especially in applications where flexible and curved-surface sensors are required. Efforts were also made to investigate the performance of nanocomposite films on copper substrate to mechanical vibrations. Thus, could be utilized for energy scavenging combining piezoelectric and pyroelectric effects. [This work is funded by NSF-HRD-1546965 grant.]

Biography

Ashok Batra has completed his PhD at the age of 28 years from Indian Institute of Technology, Delhi. With more than 24 years of experience in the diverse areas of solid state physics/materials and their applications, he is presently a professor of Physics. He is currently engaged in research related to the development of ambient energy harvesting and storage devices, nanoparticle-based chemical sensors, and organic photovoltaic solar cells. He has obtained various research grants as the principal or co-investigator from the U. S. Army/SMDC, NSF, DHS and NASA. The NASA grant was related to the International Microgravity Laboratory-1 experiment flown aboard the Space Shuttle Discovery. A recipient of a NASA Group Achievement award and the Alabama A&M University School of Arts and Sciences Researcher of the Year award, he has published over 180 publications, including two book, book chapters, proceedings, review articles, and NASA TMs. Professor Batra is a member of SPIE, MRS, AES, and AAS. He is an editorial board member of refereed international journal: Advanced Science, Engineering and Medicine.

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