

CONFERENCE TITLE: Electro-active Polymer Actuators and Devices (EAPAD) (ss04)

CONFERENCE CHAIR: Yoseph Bar-Cohen, Jet Propulsion Lab.

ABSTRACT TITLE: Flexible, low-mass devices and mechanisms actuated by electroactive polymers

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ABSTRACT TEXT: Miniature, lightweight, low-cost actuators that consume low-power can be used to develop unmatched robotic devices to make an impact on many technology areas. Electroactive polymers (EAP) actuators offer the potential to produce such devices and they induce relatively large bending and longitudinal actuation strains. This reported study is concentrating on the development of effective EAPs and the resultant enabling mechanisms employing their unique characteristics. Several EAP driven mechanisms, which emulate human hand, were developed including a gripper, manipulator arm and surface wiper. The manipulator arm was made of a composite rod with a lifting actuator consisting of a scrolled rope that is activated longitudinally by an electrostatic field. A gripper was made to serve as an end effector and it consisted of multiple bending EAP fingers for grabbing and holding such objects as rocks. An EAP surface wiper was developed to operate like a human finger and to demonstrate the potential to remove dust from optical and IR windows as well as solar cells. These EAP driven devices are taking advantage of the large actuation displacement of these materials for applications that have limited requirement for actuation force capability.

KEY WORDS: Electroactive Polymers, Artificial Muscles, Actuators, Ionomers, Cryovac operation

BRIEF BIOGRAPHY: Dr. Yoseph Bar-Cohen is a physicist with over 27 years experience in NDE, sensors, actuators and electroactive materials. He is the Jet Propulsion Lab (JPL) Resident NDE expert and the Group Leader for the NDE& Advanced Actuators (NDEAA) Technologies. Also, he is an Adjunct Professor at the Department of the Mechanical and Aerospace Engineering, the University of California, Los Angeles (UCLA), a Fellow of the American Society for NDT (ASNT) and Chair of the ASNT's Ultrasonic Committee. Dr. Bar-Cohen discovered the leaky Lamb waves and the polar backscattering in composite materials and co-pioneered their applications to NDE. He is the author of more than 135 publications, made numerous presentations at national and international symposia and holds many patents.