



# Flexible metallic interconnects for displays applications



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Robust electrical interconnects are considered one of the major enabling technologies for the next generation of electronics. Flexible electronics inherently introduce added levels of complexity to the design. In particular, mechanical flexibility poses a new challenge for current interconnect technology required for flexible display applications. Flexible display applications for example, which broadly include conformable and roll-able displays (Fig. 1), will require flexible and robust substrates, electronics, optical layers, circuitry and reliable interconnects, that can additionally withstand significant amount of deformation without considerable changes to the electrical properties.

In previous work, we showed that thin metal films demonstrate excellent electro-mechanical performance when subjected to high uni-axial mechanical strains and repeated rolling and fatigue tests. Our experimental results have been compared with simple mechanical models to determine some of the critical parameters that must be considered for optimization of the materials and processes developed. Our most recent work now evaluates the performance of the flexible electrodes under biaxial strains, to better simulate more realistic conditions under which flexible displays would be used. In this evaluation, the conductive thin films deposited on plastic substrates were loaded in a window of a pressurized chamber while the chamber was pressurized to create a bulge in the conductive membrane (Fig. 2).

Results from the biaxial electromechanical evaluation of the thin film electrodes show that the thin metal film electrodes remain conductive with no noticeable change in electrical resistance (Fig. 3), as desired for applications.



Fig. 1. An artist's rendition of a electronic paper display, which undergoes mechanical strain in more than one dimension.

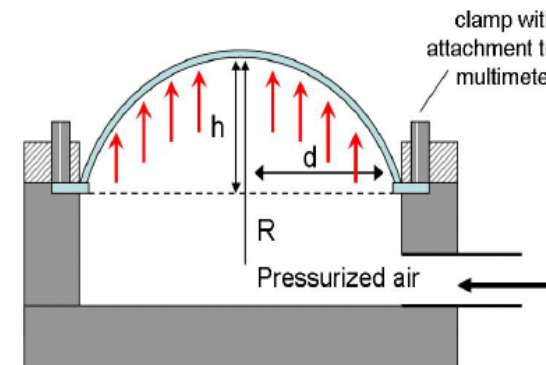


Fig. 2. Biaxial electromechanical evaluation of flexible electrodes

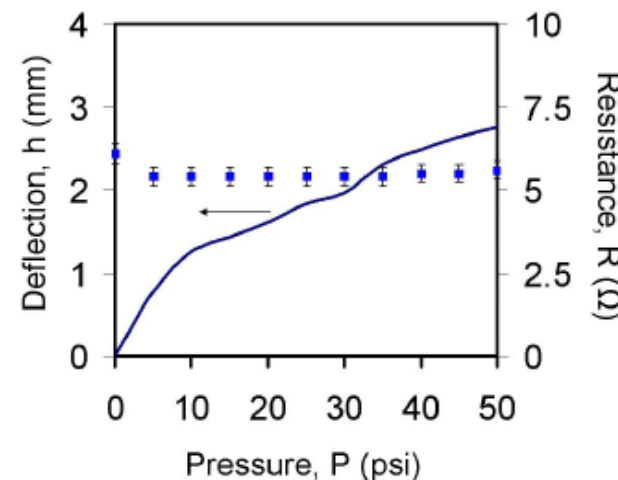


Fig. 3. Measured bulge deflection and film electrical resistance versus pressure. The resistance is independent of the pressure and the deflection.