



**CALIFORNIA STATE SCIENCE FAIR  
2014 PROJECT SUMMARY**

<b>Name(s)</b> <b>Adrian E. Samkian</b>	<b>Project Number</b> <b>S0327</b>
<b>Project Title</b> <b>Economically Modify Liquid Crystals Displays to Increase Flexibility and Durability</b>	
<b>Abstract</b> <b>Objectives/Goals</b> The purpose of this project was to redesign a passive matrix liquid crystal display, using a flexible polymer as a substrate as opposed to glass used in commercial displays. This would offer many advantages including lighter, cheaper, shatter-resistant properties, as well as creating flexibility, but would still have to maintain the image quality of a glass display. <b>Methods/Materials</b> The core design of the screen included having N-(4-Methoxybenzylidene)-4-butylaniline (liquid crystal) with silica beads between two Indium tin oxide coated substrates: glass as a control, and polymer (PET) as the test screen. Two perpendicular polarizers are then added outside and the edges sealed. Once the screens are built voltage comparisons, qualitative image tests and price comparisons were done to compare the built screens to a commercial screen as well as to each other. <b>Results</b> Results indicate that both screens respond similarly to current, changing from a clear yellow to an opaque white, or black to an opaque white, depending on polarizer orientation. The polymer screen was flexible, however bending it greatly affected image quality as resistance heavily dropped. Prices indicate that a polymer screen saves less than 1% money than a glass screen. <b>Conclusions/Discussion</b> My hypothesis was correct in that the polymer screen was lighter, flexible, and shatter-resistant, however this still is not enough to make it practical, due to its being more difficult to build, having delayed transition time, and having such a low price difference that it is simply not worth using unless a more suitable polymer or building method is used. However this is a proof of concept that flexible LCDs are a definite possibility.	
<b>Summary Statement</b> I replaced the glass substrate with a flexible polymer in an LCD in hopes that it would decrease price, weight, thickness, eliminate the tendency to shatter, while keeping the same if not better image quality and ease of construction.	
<b>Help Received</b> Ms. Tuason supplied one of the chemicals in my project, a friend found a website that sold another material	