

From Prof. Mark:

I do not think there should be a high shearing force between the layers if the multi-layer device is functioning properly.

The two layers, upper and lower, should experience almost the same strain; therefore the shear stress between layers

should be small. The only exception to this rule would be when the applied voltage across the two layers is different. Therefore, I think the cured electrode should not have a large effect under most circumstances.

In any case, this is something that we can prove with testing.

Recognize also the that so-called "rigid" electrode is not really rigid. It is elastic, although it is stiffer than the VHB

film. But it is also quite thin. We should do some test to establish the thickness of the electrode in comparison to the acrylic film. It might require using a laser profilometer.

From Shiquan:

I totally agree.. Let's see in this way: assume that voltage in each layer is the same:

1) from the plot (http://bdml.stanford.edu/uploads/Honda/WorkLog/Plot_force%20vs.%20time_Feb25.png) we can see that the influences on overall stiffness from non-cured and cured sheet are almost exactly the same.

Th reasons are:

-The cured electrode is basically a super thin silicone layer. And the silicone is using super soft one(http://www.smooth-on.com/tb/files/DRAGON_SKIN_SERIES_TB.pdf), 10A hardness, only 22 psi modulus. So it is by no means "rigid".

-It is highly possible that such a thin layer of silicone cured in this way, it is slack under small elongation.

2) When we combine several layers together (two adjacent films are touching each other) and exert a force on the diaphragm:

-if there is shear displacement between two adjacent layers, it is bad for the actuator since it will cause abrasion and reduce the durability, which needs to be prevented.

-it there is no shear displacement, according to 1), the shear force of non-cured and cured one should be the same, at least such a small scale of 5 layers.

Besides, I highly suspect that this 5-layer diaphragm is not charged properly, because I can not observe any instantaneous wrinkle wave on the film which should appear if it is charged properly. So please patiently wait until I make another better one and rule out the obvious and potential factors. After all, this sample is a rather primitive one that was made by new method for the first time.

This paper (<http://www.sciencedirect.com/science/article/pii/S0924424707007431>) might help to relieve your worry. 3-layer cured electrode EAPs are used in this paper.