Flexible Large Area MEMS

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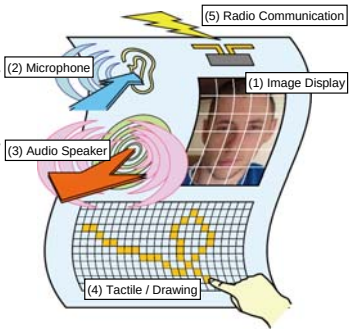
Abstract:

Previous works on MEMS actuated Fabry-Perot interferometer (FPI) highlighted promising results for flexible display applications. Three primary color pixels have indeed been obtained using both photolithography and Roll-to-Roll printing process with satisfying color purity and transmittance. A new process based on inkjet printing has been set up to contribute in a more ecological-friendly, high reproducible and fast process development while targeting improved features.

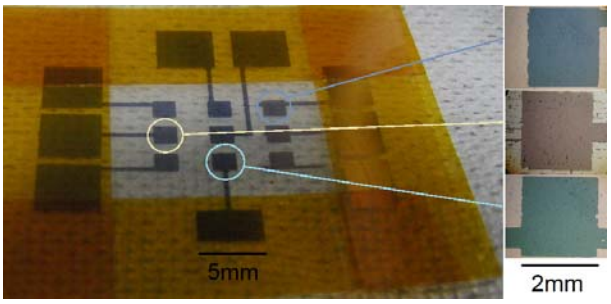
Introduction

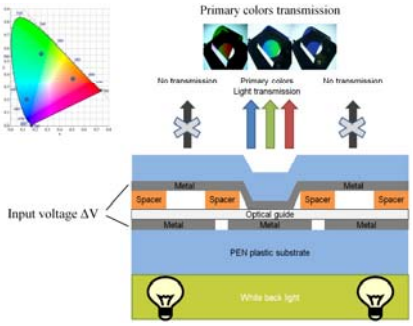
Recent market trend reports escalating interests of customers for portable devices and most particularly in display and entertainment field. In this context, new flexible devices intend to replace traditional publication media, such as papers and books, by using flexible polymer substrate gathering light weight, low consumption and high integration.



Fabry-Perot Color Pixels

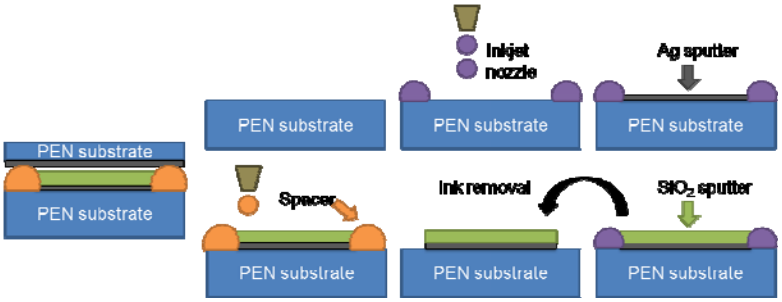
Under electrostatic Coulomb force, the upper layer will be attracted down to contact the isolation layer (SiO_2) and satisfy Fabry–Perot interference condition. The output light is then changed from input backlight (white light) to different colors according to different SiO_2 thickness.



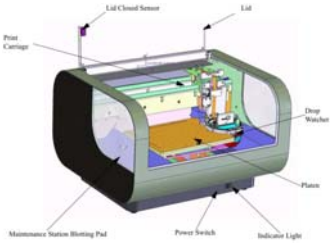


Thanks to high transmittance, flexibility and vivid colors, Roll-to-Roll FPI device could be easily used in the display field and more particularly for decoration or flexible panel.

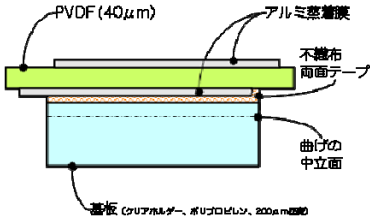
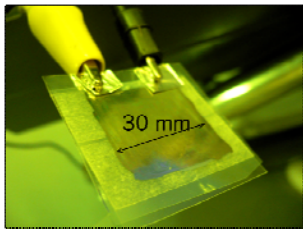
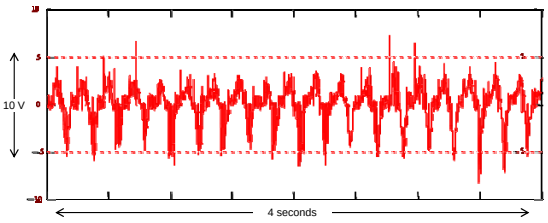
Typical Fabrication by Printing



For fast processing and environmental point of view, inkjet printing is chosen to be the next step in fast research and versatile potentialities.



Side-line Products

--- PVDF Power Generation Device ---

Printing technique can also be applied to make metallic electrode patterns by using the mounted ink as a mould for the lift-off process. We developed a prototype device to demonstrate power-generation from a PVDF (polyvinylidene fluoride) film. The film can be manually bend to conform a voltage output upwards of +/- 5V when a 10MOhm resistance is connected as a load. This device could be used as a power-generation module for large area MEMS.