

### The fabrication of bi-functional nano-patterned ITO substrates for liquid crystal alignment

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We report that the line patterned ITO substrate can be successfully used for controlling LC alignment and as a transparent conductive electrode simultaneously. The ITO nano-patterns with 10nm scale width and high aspect ratio over large area were fabricated by the secondary sputtering lithography. “secondary sputtering lithography (SSL)” is introduced a new patterning technique by our group, it can enables fabrication of complex nanostructures with 10nm scale features and high aspect ratio, which can apply most materials. By using our patterned ITO substrates, we have realized a good alignment of LC on the nano-patterned ITO substrate with an azimuthal anchoring energy that is comparable to that of rubbed polymer films. In addition, we have carried out a series of experiment to study the quality of LC alignment, depending on anchoring energy by precisely controlling feature size of ITO pattern based on Berreman’s theory.