

**Low-temperature sol-gel metal oxide electronic materials:  
DUV photoactivation, large-area printing, selective patterning, and bio-electronics**

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Metal oxide-based electronic materials have found important applications in displays, memories, photovoltaics, and sensors due to their outstanding optical and electrical properties. Despite the latest advance in printing technology, however, the low temperature processability has been a bottleneck to realization of such devices on large-area and flexible substrates. Just recently, many distinctive and effective methods to fabricate metal oxide films at low temperatures have been reported by several research groups. Unfortunately, there is still a lack of understanding on the detailed mechanism behind the apparent improvement in terms of low-temperature processability. Herein, we report on the successful fabrication of sol-gel metal-oxide semiconductor and dielectric films at low temperature by using UV irradiation and a general UV-photoactivation mechanism of high-quality oxide film formation supported by ellipsometry, UV-Vis/IR spectroscopy, XPS, and mass spectrometry analyses. In parallel, we demonstrate the simple patterning and printing methods for all solution-based sol-gel metal oxide transistors, and, finally, their application to the *in vitro* bio-electronic devices interfacing with live cells.