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In Situ Dry Etching Processes for Moly Multi-Layers with application to the Reduced Process-Less Mask TFT

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Molybdenum (Mo) and amorphous silicon (a-Si) multi-layer serial dry etching process is developed for a simultaneous patterning of Mo Source-Drain (S/D) line and active island in thin film transistor (TFT) for active matrix liquid crytal display (AMLCD). With reactive ion etching mode, the SF_6/O_2 mixture gas system drives a Mo etching rate of more than 900Å/min and a smooth taper profile (<20°), while the critical demension (CD)of the S/D line is skewed 2.7 ㎛. For the Cl_2/O_2 mixture gas system, the etching rate of the Mo layer is more than 700Å/min and the CD skew is controlled under 1㎛, but the taper angle goes bad (>80°). The two step etching process realizes the under-cut free, in situ patterning for S/D line and active island with 5% uniformity and the 2nd step process with SF_6/Cl_2 gas mixture, ensure the selectivity for the silicon nitride layer, is followed by the 1st process as the SF_6/O_2 or Cl_2/O_2 gas etchings. It is very requisite for the process simplification as well as for the reduced mask step in TFT manufacturing.