What are the major difference between semiconductor process and MEMS (Micro Electro-Mechanical System) process?

Abstract

Basically, the methods and equipments used in semiconductor process and MEMS process are pretty much the same; the major differences between them come from the differences in the spec requirements.

Semiconductor process usually involves multiple epitaxial films and other films (of several microns thickness) instead of being made on the substrate (several hundreds microns thickness); semiconductor process is usually limited to the surface and is thus of pure surface machining. However, semiconductor process is usually used to make very small device (of extremely small line width).

For the MEMS process, in addition to surface machining, it usually involves the so-called bulk machining, that is, the process is made on the substrate and sometimes trenches of very high aspect ratio are needed to be made (aspect ration: the ratio between etching depth and etching width); sometimes, even the substrate has to be etched through and only thin film is left (the un-etched substrate is left as support). Generally, MEMS device is larger than semiconductor device (This is not necessarily true and it usually depends on the device spec).

Therefore, if we take a dry etching machine as an example, the requirement by semiconductor process is probably to etch very small line width, but for MEMS, the process requirement is probably to etch an aspect ratio high enough. (Both of them do not contradict to each other but have difference focuses)