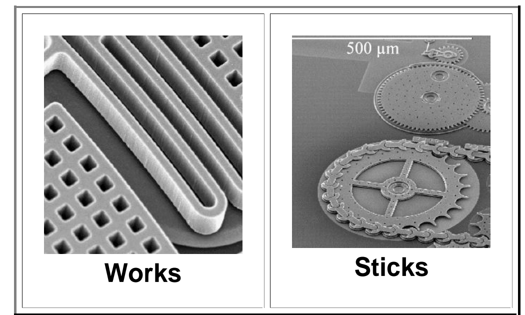
7.2.4 Summary to: 7.2 Processes and Specialities

- MEMS uses all of "known" **Si** technology and has some specifics of its own.
  - Making cantilevers and membranes necessitates making "large" cavities.
  - Staying absolutely planar and stress-free is essential
  - Packaging can be far more demanding than for chips (e.g. transparent tops for **OMEMS**, keeping defined pressures for **> 10 a** in gyros).



- The ***bane*** of **MEMS** is **stiction**.
  - If you can't lubricate, it will stick sooner or later. Never bring moving parts in contact!
  - **MEMS** design therefore cannot just miniaturize exiting mechanical designs; it must look for new approaches.

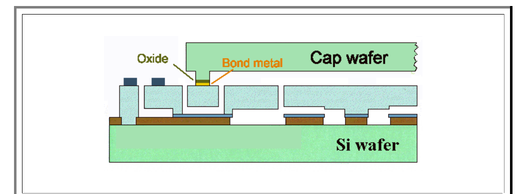
- **MEMS** employs some special processes and materials; they are the drivers of progress
  - Anisotropic chemical etching
  - High-rate plasma etching ("Bosch process")
  - Chemical-mechanical polishing
  - Sacrificial layers and removal (including chemical etching with "vapors")
  - Wafer bonding; in particular for packaging.

Making "large" cavities and extremely deep "holes"

Planarization

Free-standing structures

- Process integration looks simple if compared to an advanced **CMOS** process, but is actually rather involved due to the special processes needed and quality requirements



Exercise 7.2-1

All Questiosn to 7.2