Micro- and nanotechnology systems are important in many sustainable products like solar cells and chemical, mechanical and optical sensors. Keeping the systems small will make a smaller demand for material and energy during production and also a smaller demand for energy during use. In these systems thin films of different kind are important parts of giving the system the properties needed. This can be properties like light absorbing layers, antireflection coatings or conductive layers in solar cells. It can be low stress layers in membranes, chemicals resistant layers in chemical sensors, layers with specific optical properties in optical sensors, piezoelectric thin films or insulating layers in many other applications. These different materials and properties impose a demand for different kind of deposition techniques. At DTU Danchip we have a large variety of these deposition techniques that can be used separately or in combination to give the micro/nano system the properties needed. These techniques and film properties are presented. ALD (Atomic Layer Deposition) is good for very thin films (down to monolayers) with extremely good stepcoverage and extremely good control of the layer thickness. LPCVD (Low Pressure Chemical Deposition) is good for dielectric layers for optical components, light absorbing layers, membranes and cantilevers. The processes take place at high temperature and create high quality films with high step coverage. PECVD (Plasma Enhanced Chemical Vapor Deposition) is good for fabricating dielectric layers for optical components and insulation layers. The layers are deposited at relatively low temperature (300°C). Sputter deposition deposits almost any material (metals and dielectrics including alloys) at low temperature with good step coverage. E-beam evaporation is good for high quality thin film metal deposition e.g. for electrical leads or surface plasmonic devices. MVD (Molecular Vapor Deposition) is used for making anti stick coating. Below is shown an example of Atomic Layer Deposition which is a self-terminating chemical vapor deposition technique based on sequential introduction of precursor pulses with intermediate purging steps. The process proceeds by specific surface ligand-exchange reactions and this leads to layer-by-layer growth control. No other thin film deposition technique can approach the conformity achieved by ALD on high aspect ratio structures. The figure shows 4 μm deep Sitrenches with the period of 400 nm, coated with ALD TiO₂/Al₂O₃ multilayers. The insets show high resolution SEM images of top and bottom parts of coating. This is an example of extremely high conformity deposition of multilayer thin films on high aspect ratio structure.

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