

## Thin film growth by directed energy input

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Whereas in more traditional physical and chemical methods for thin film deposition atoms and molecules with thermal energies of  $\sim 10$  meV are involved, in this talk preparation methods based on ion-, plasma- and laser-beams will be presented, which involve atoms / ions / molecules with energies between  $\sim 10$  eV and  $\leq 10$  MeV. The resulting effects not only depend on the achieved **high local energy density** but also on its **specific direction** along the flight pass of the energetic particle. Different examples will be shown to demonstrate the resulting beneficial effects on a wide variety of interesting mechanical, electrical and optical properties based on

- enhanced diffusion
- intermixing of interfaces and enhanced adhesion
- densification, hardening, reduced wear
- improved crystallinity
- non-equilibrium phases and metastable reactive surfaces

as well as

- biaxially textured thin films for improved epitaxy over larger areas.

At the end also a-C:H coatings with improved biocompatible and antibacterial properties will be presented.