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**DS 8: Hard Coatings I**

Time: Monday 14:30–15:15

Location: H34

**Invited Talk**

DS 8.1 Mon 14:30 H34

**Processing, properties and application potential of nanostructured hard coatings** — ●PAUL MAYRHOFER — Department of Physical Metallurgy and Materials Testing, Montanuniversität Leoben, 8700 Leoben, Austria

Nanostructural design strategies have attracted increasing interest in modern development of hard coatings for wear-resistant applications. Here, we demonstrate the correlation between microstructure (or nanostructure) and mechanical as well as tribological properties of hard ceramic coatings. The microstructure can be designed by choice of the deposition technique, either by sequential deposition of layers or by taking advantage of newly discovered self-organization processes

including segregation effects of the elements. Limited atomic assembly kinetics during the deposition process are responsible for the formation of defects (point-, line-, and area-defects), supersaturated, and metastable phases. Due to their particular structures, such coatings can exhibit superhardness ( $H > 40$  GPa). The microstructural changes of hard ceramic coatings during a post-deposition annealing treatment are discussed in detail. The review clearly shows that nanostructure dependent hardness increase (compared to hardness of the bulk counterparts) sustains higher annealing temperatures than hardness increase which is obtained by and increased density of point- and/or line-defects. Tribological properties of hard thin films can be engineered by adding phases with lubricious properties at operation temperature (either room or elevated temperatures) and prevailing environment.