Innovative materials solutions with thermochemical surface engineering of steels

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Thermochemical surface engineering of steels provides a sheer endless source for innovative materials solutions. In this lecture a cornucopia of materials solutions relying on low temperature surface hardening (LTSH) and high temperature solution nitriding (HTSN) is presented, in some cases in combination with additive manufacturing. The following examples are included:

- LTSH of conventional and additively manufactured stainless steels by carburizing
- Simultaneous LTSH and bulk hardening of maraging steel and precipitation hardening stainless steel;
- HTSN for improving austenite stability and preventing strain-induced martensite formation during severe deformation;
- HTSN of duplex stainless steels for improved resistance against crevice corrosion;
- Combatting white-etch cracking in bearings with HTSN and eutectoid decomposition to obtain a fine-grained martensitic case.

For the examples given it is demonstrated that a deep understanding of materials microstructure development and its relation to materials performance is a prerequisite for successful innovation.