The essence happens in a thin layer
QuadCoatings®
New Generation of PVD Coatings for Cutting Tools

T. Csellé – M. Morstein – A. Lümkemann, PLATIT AG, Selzach, Switzerland

The developers and manufacturers of coating systems and high-performance coatings continuously face a dilemma:
- Industry requires ever more capable, new coatings, but
- the coating spectrum should not grow uncontrollably so that users can no longer keep track of them.

The PLATIT company solves this dilemma with a systematically designed coating spectrum. It comprises 4 generations:

**1st generation**
The 1st generation includes the monoblock structures. Typical coatings are TiN, AlTiN, AlCrN-monolayers, which due to their inexpensive depositing are preferred by many job coaters. PLATIT recommends this coating structure only for the very conventional “original coatings” (TiN, CrN, ZrN and the like).

**2nd generation**
The 2nd generation first has an adhesive layer and then the monoblock. To deposit it, the systems with spot cathodes must sacrifice a complete cathode series for the adhesive layer. It, of course, costs time and money when coating. The machines with rotating cathodes have two decisive advantages here.

- Their cathodes cover the entire coating area and
- The layer stoichiometry can be generated flexibly through software from the non-alloyed cathodes.

PLATIT offers practically all conventional layers following the layer structure of the 2nd generation; AlTiN\(^{(2)}\), AlCrN\(^{(2)}\), nACo\(^{(2)}\), nACRo\(^{(2)}\) etc (*). These coatings are the flagships of the 2-cathode systems (\(\pi 80\), \(\pi 111\), \(\pi 211\)).

**3rd generation**
The 3rd generation is the group of TripleCoatings\(^{(3)}\),

- The coating layer is deposited from non-alloyed Ti or Cr targets.
- The core layer is meant to provide the entire layer with good toughness. For this reason, it is usually formed as a multilayer or nanolayer.

**c.** The top layer displays high hardness and wear-resistance, which is the reason it is normally made as nanocomposites.

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**4th generation**
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**nACRo\(^4\)**
Structure: CrN, AlCrN Gradient, AlCrN Nanolayer, nACRo Nanocomposite.
Main application: Milling, Hobbing.

*: Since PLATIT only uses coatings with an adhesive layer, the exponent \((2)\) is often omitted.
New 4th generation

The new 4th generation was developed with the new n411 system and presented at the AMB 2012. Here, 4 cathodes work simultaneously. Added to the triple structure is a 4th element or feature. For example:

a. The combination of gradient and layered core layers, in order to achieve an optimal toughness/hardness ratio (see TiXCo4 in Figure 1).

b. Or an adapted double core layer, which was developed, dedicated for hob cutters (see nACRo4 in Figure 2).

c. An oxid or oxynitride layer, which gives the total coating a high degree of heat insulation and permits very high cutting speeds (see nACoX4 in Figure 3).

d. A lubrication layer (e.g. CrCN, or DLC), which markedly reduces the friction coefficient of the coating (see AlCrTiN4 in Figure 4).

The coatings with the same basic names from the various generations have the same or similar application areas. As a result, the recognition value of the layers is increased and users of older systems are not discouraged. Of course, the higher exponent points to the increased performance potential. For example:

- nACo2, nACo3, nACo4 are the coatings for drilling and can be used universally as successors to AlTiN coatings.

- nACRo2, nACRo3, nACRo4 are primarily suitable for milling, hobbing and machining high-alloyed materials or

- AlTiCrN2, AlTiCrN3, AlTiCrN4 are recommended for cooled, wet cutting.

In the systematic build-up of a coating spectrum, we believe the name should give users clear technical information. And so we do not use fantasy names, which might sound good and fancy but with their variety usually only confuse users.

The results in the laboratory and in practice are extremely good. Therefore, we are convinced that the 4th generation of PLATIT coatings will soon play an enormously important role in high-performance cutting technology.
PLATIT introduced at the AMB a brand new coating system, the π411. For the first time, as a world premiere. The editorial staff held an interview with the CEO of PLATIT, Dr. Tibor Cselle, prior to the opening.

Editor: How does the new machine fit into your production programme? Which users is the system intended for?

Dr. Tibor Cselle:

The π411 is the latest member of our “11” machine series. We already showed the small variant π111, with a work surface of 355 x 460 mm, three years ago at the EMO 2009 in Milan. Several systems are already working worldwide, primarily in small, flexible companies and coating centres.

This was followed by the compact system π311 for medium-sized companies in Stuttgart two years ago. Its most important highlights are its enormous flexibility and its now so famous TripleCoatings TripleCoatings3®. This 300 series is our bestseller; more than 70 systems are working for customers in 20 countries.

The current variant π411 is designed for companies that wish to produce high-performance coatings with high productivity and work around the clock. Like we do.

Editor: What are the most important features of the new machine?

Dr. Tibor Cselle:

First, the high ease of loading and productivity. The system coats 504 cutters with 10 mm diameter in 3.5 hours.