However, despite plenty of development works within this topic, a need for improved cutting performance in machining operations drives to more extensive investigations of properties and deposition processes of aluminum titanium nitride coatings.

Objective of the present invention

It is an objective of the present invention to provide an aluminum titanium nitride coating system for high performance cutting tools, in particular a broadband coating for cutting inserts which allows higher productivity compared to the state of the art. Furthermore it is an objective of the present invention to provide an industrial-suited coating method for manufacturing the aforesaid high performance coated tools. Additionally the coating method according to the present invention should be as robust and uncomplicated as possible.

Description of the present invention

The aforementioned objective is achieved by the present invention by providing an aluminum titanium nitride coating system having adjusted morphology and a coating deposition method thereof, both of them especially designed for improving efficiency of high performance cutting tools.

In one aspect, there is provided an (Al,Ti)N coating exhibiting at least two different coating portions, A and B, having grain size in nanometer magnitude order characterized in that the coating portion A exhibit larger grain size and higher elastic modulus than the coating portion B.

In another aspect, there is provided a substrate at least partially coated with an (Al,Ti)N coating as described above.

In another aspect, there is provided a method for coating a substrate as described above, characterized in that at least the coating portion A and/or the coating portion B of the (Al,Ti)N coating are/is deposited by means of PVD techniques.

In another aspect, there is provided a PVD method for depositing a coating on a substrate, said coating having at least two different coating portions, A and B, said A and B coating portions having different grain size, preferably in nanometer magnitude order, the coating portion A exhibiting an average grain size larger than it in the coating portion B, characterized in that the plasma produced during the deposition of the coating portion A exhibit a lower electron temperature and/or lower ionization of the reactive gas in comparison with during the deposition of the coating portion B.

The (Ti,Al)N coating according to the present invention is a monolayer coating exhibiting two different areas or coating portions, A and B, characterized principally by different morphology structures.

The inventors found surprisingly that the cutting performance of the (Ti,Al)N coatings can be considerably improved when the coating portion A exhibits a basically more pronounced columnar morphology structure and larger grain size than the coating