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DEPOSITION OF TI_2ALC MAX PHASE BY CATHODIC ARC DEPOSITION (ARC-PVD)

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In late 1990s the term MAX phases was coined and determined as new family of nitrides and carbides with chemical formula $M_{n+1}AX_n$, where n=1…3, M is an early transitional metal, A is an A-group element, and X is carbon or nitrogen. MAX phases have interesting properties both in bulk form and in thin film coating form. One of prospective methods to synthesize MAX phase thin film is a cathodic arc deposition due to its relatively high deposition rate compared to magnetron sputtering. Ti_3AlC_2 and especially Ti_2AlC are promising MAX phases in terms of high-temperature applications due to formation of stable α-Al_2O_3, therefore a technology of these phases synthesis is important for exploration.

In this work Ti_2AlC was a desired MAX phase for thin film deposition. There are 2 ways to evaporate and deposit Ti and Al: using 2 elemental targets made from pure titanium and aluminum and using one Ti-Al target. In some works, it was shown that deposition from 2 different targets are more preferably due to possibility to use optimal evaporation mode for each element. It is also known that the following annealing can significantly improve formation of desired MAX phase in coating. Therefore, in current work reactive Arc-PVD technology with 2 cathodes was used. After deposition some samples were annealed in vacuum at 800 ^{O}C with 30 minutes' step at 550 ^{O}C. Chamber atmosphere consisted of C_2H_2/Ar mixture which was supplied through hollow-cathode plasma generator.

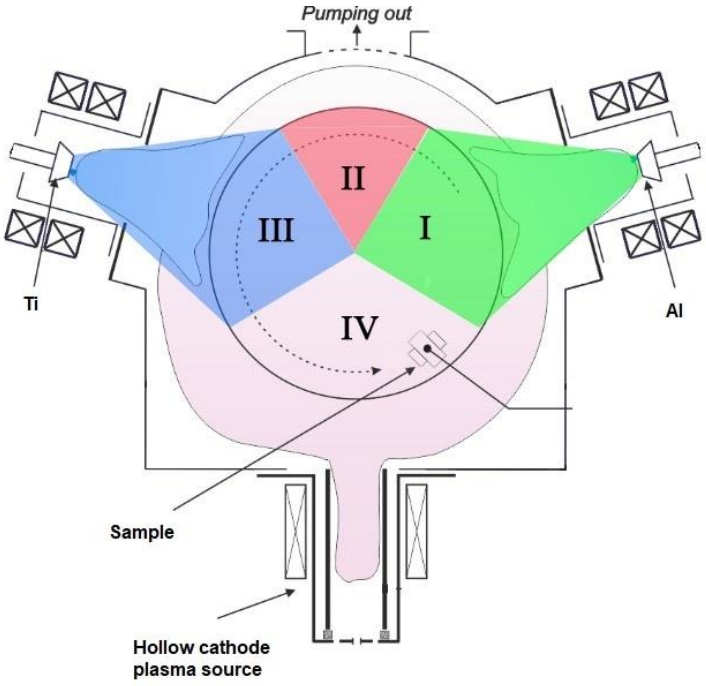

Fig.1. Deposition scheme

Current results demonstrate that amount of Ti_2AlC phase in coating is not 100%, but following annealing improves MAX phase formation, as it was described before. A promising planned way to improve formation of Ti2AlC MAX phase is the use of 2 plasma sources (hollow cathode and heated cathode sources) to improve reactive atmosphere ionization and to increase substrate temperature.

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