ELECTROPHORETIC DEPOSITION OF A METAL-CERAMIC COATING CONTAINING MCrAlY (M:Ni,Fe) BOND COAT FOR CARDIOVASCULAR IMPLANTS

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Introduction
The main aim of the presented project is the development of a reproducible, tailor-made metal-ceramic coating with hemocompatible properties for permanent medical use on cardiovascular implants with direct blood contact such as stents. In addition to hemocompatibility, the coating should increase the lifetime of the applied materials. The metal matrix provides the necessary flexibility and adaptation of the expansion to the substrate. The dispersed ceramic particles in the metallic matrix improve the hemocompatible properties of the coating [1-3].

Experimental Methods
In this work, MCrAlY (M: Ni, Fe) bond coat and Al-Al_2O_3 top coat were applied using electrophoretic deposition and sintering. Using the electrophoretic deposition and the charging system of iodine-acetone, NiCrAlY and FeCrAlY bond coat was successfully deposited on a steel substrate. The samples were sintered in argon and vacuum ($1x10^{-5}$ mbar) at the range of temperatures from 1000°C up to 1200°C for 30 and 60 minutes. In order to improve the adhesion, the steel plates were previously sandblasted. The Al-Al_2O_3 composite coating was applied as a second layer by the electrophoretic deposition and the charging system of iodine-acetone and sintering, as well. To evaluate the phases formed at each temperature the XRD-analysis was performed. The morphology of the samples was analyzed by SEM and an adhesion test was executed.

Results and Discussion
In this study, we could show that the MCrAlY (M:Ni,Fe)-coatings could be successfully obtained by the electrophoretic deposition by using the charging system of iodine-acetone without any other additives. It is also possible to perform the sintering in argon or vacuum atmosphere with good adhesion to substrate. The top coat (Al-Al_2O_3) adheres the bond coat in a proper way. Hemocompatibility tests according to ISO 10993-4 are ongoing.

Conclusion
MCrAlY (M:Ni,Fe) is a trendy and promising material that can provide good adhesion of ceramic and metal and can be applied by a simpler method like the electrophoretic deposition. It can be used not only as thermal barrier coating but also as a bond coat for ceramic coatings for medical use.

References
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