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Two New Materials for Dynamic Penetrator Tips

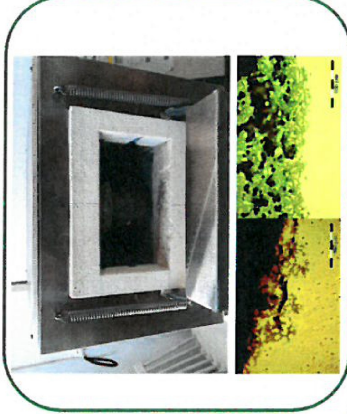
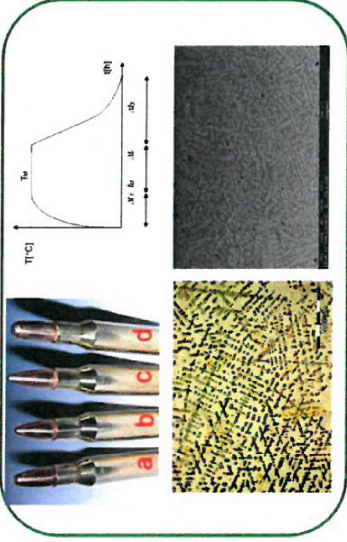
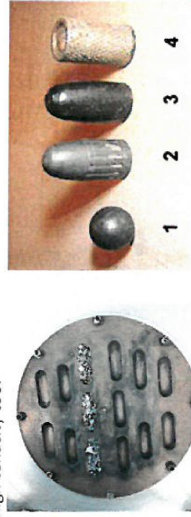
Introduction

Penetrators with high kinetic energy, for example WC (tungsten carbide), with density higher than 17g/cm³, have the disadvantage that they break in contact with the target and consequently are not efficient. For this reason, new alloys have been designed for use to manufacture of dynamic penetrator tips.

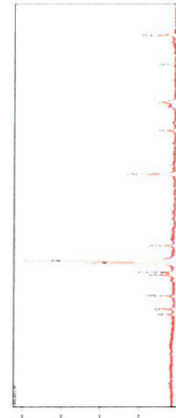
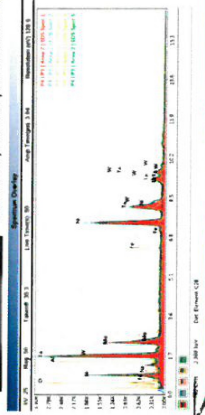
Technical challenge

The multicomponent alloys from HfMoNiTaW and HfMoNbTaW systems have been obtained by melting of pure raw materials in electric arc under argon-protective atmosphere

A new multi-component system that can be used for the manufacture of bullets is proposed in the framework of the project. The alloy has been obtained from metals with high densities such as Hf, Mo, Ni, Nb, Ta, W, in order to obtain a high density material with a high tenacity too.



After obtaining, chemical composition and mechanical measurements were performed and alloy compounds were identified by XRD analysis. The mechanical properties were determined at Nanomaterials Laboratory from Gran Canaria, Spain. The obtained results showed that the new alloys fall into the category of high density materials, being suitable for use as dynamic penetrator tips.



Conclusions

The obtained alloys were subjected to micro structural analyses, mechanical tests, and also dynamic impact tests using incendiary perforation projectiles. At the same time, some tests were carried out on ballistic packages made of different materials, including high-entropy alloys. The results obtained in mechanical tests revealed high values of microhardness (over 600 HV0.1) as well as compressible strengths above 2000 MPa. The mechanical characteristics of these alloys can undergo substantial changes by applying several heat treatments