Discovering the missing material

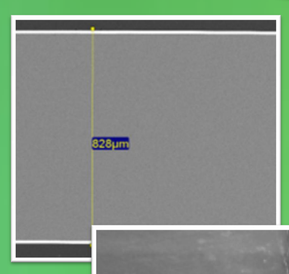
O. D. Santo Domingo de Silos

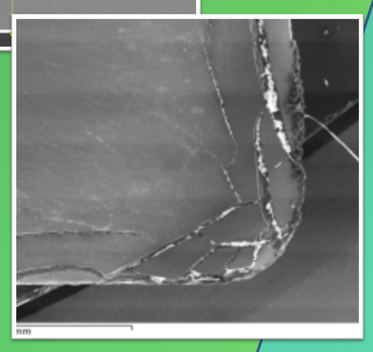
Before beginning the advanced research we did a previous basic analysis. We found that the density of the material is similar to aluminium´s. Besides, it is a thermal and electrical conductor but magnetic properties were not found.

Scanning Electron Microscope

This device emits a electron beam in order to analyse the material`s topography and local chemical composition.

After scanning the sample the microscopy shows that the central zone of the surface is smooth but the edges are cracked. On the other hand, the cross photograph shows the material is formed by a central core of aluminium coated by a thin layer of cobalt, phosphorus, chrome and nickel.





Consequently the material is designed to have magnetic properties.

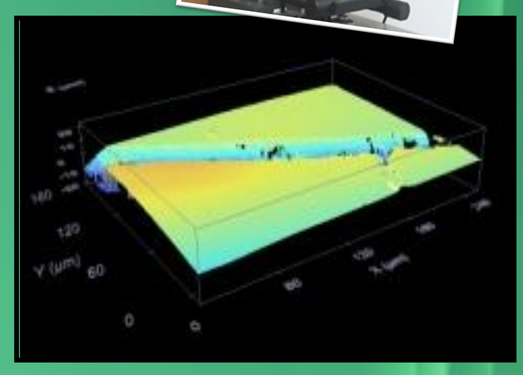
Zone	Mg	Al	P	Cr	Ni	Co
Core	4.3%	95.7%	-	-	-	-
Surface	-	-	9.3%	5.5%	82.4%	2.6%

Weight percentage

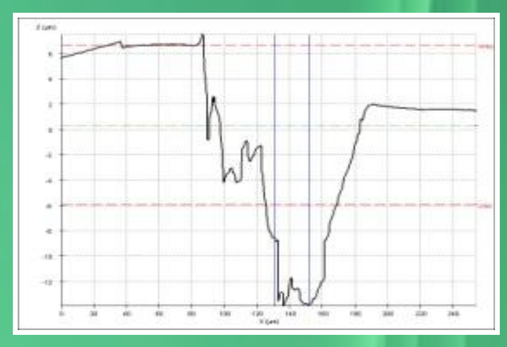
Confocal Laser Scanning Microscopy

This microscope scans the surface of the sample in detail producing crack profiles and 3D graphs of surface sections.

The analysis demonstrates the surface is totally smooth although we observe tiny roughness and the cracks observed on the edges.



Attending to the results obtained previously, we can say that the material is so smooth in order to something can move closely over it.



Finally, the analyses that we have done, show us that the material have a storage application and it's a piece of a HARD DISK.

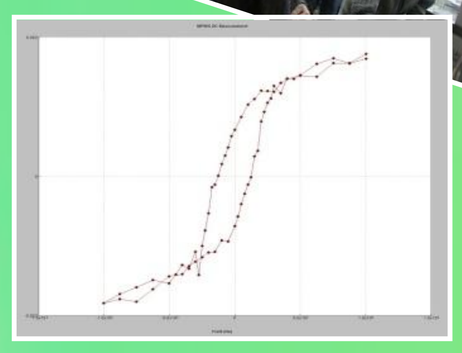
Both the SEM and CLSM show that the material is compound by a central aluminium core with a cobalt and nickel covering. It also has a smooth surface.

With MPMS and AMFM, we can see that the material has magnetic domains which are easily reversed.

Magnetic Property Measurement System

This device creates a magnetic field by a superconductive coil in order to study the material´s magnetic field and how it reacts to.

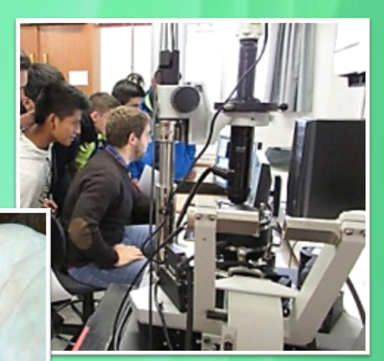
According to the graph of the hysteresis loop, we are sure that the magnetic field can be easily changed. It means that its polarity can be reversed so it has magnetic applications.



As a result, the object is made of a medium magnetic substance, so it may have data storage applications.

Atomic and Magnetic Force Microscopy

This microscopy works scanning the material with a nanoscopic silicon tip which registers the surface and the magnetic domains.



After scanning the surface, we found it was totally smooth as we already knew. We also found that it showed ordered marks related with magnetic domains.

In conclusion, we discover these domains match the two states of hysteresis loop.

Acknowledgments

Ibercaja FECYT icma iSQCH CSIC University of Zaragoza