

## Effect of the Cobalt addition on the electrochemical behaviour of FINEMET type amorphous alloys

A. Altube, A. R. Pierna, F.F. Marzo, M. Sistiaga,  
A. de Anta, C. Tojal and A. Lorenzo.

Dept of chem. Engineering and Environment. University  
of the Basque Country.  
P. O. box 1379. San Sebastián. Spain.

Since their discovery in 1988 by Yoshizawa et al., much work has been done concerning to the electrochemical study of Finemet type amorphous metallic alloys; but, to the knowledge of the author, the electrochemical behaviour of cobalt containing Finemet alloys has received little attention. In spite of this, the magnetic properties [1] and the thermal stability [2] of such alloys have been subjects of interest.

The aim of this study is to report the effect of the partial substitution of iron by cobalt on the electrochemical behaviour and thermal properties of Finemet type alloys containing different amounts of cobalt in acid and basic media. The basic composition of this kind of amorphous alloys can be written as  $Fe_{73.5-x}Co_xCu_1Nb_3Si_{13.5}B_9$  ( $x = 2, 4, 6, 8, 10$ ).

The DSC experiments give information concerning to the thermal events taking place in the alloys. On the other hand, when the relaxation and nanocrystallization processes are useful to enhance the corrosion resistance of the alloys. From the measured values listed in table 1 it can be observed that the addition of cobalt shifts the  $T_{r1}$  towards higher temperatures, but the onset temperature is essentially the same if Co content is up to 10% at.

DC and AC electrochemical techniques have been used in order to obtain information on the electrochemical behaviour of these materials. The presented results in figures 1 and 2 show that the new component destabilizes the oxide layers in KOH, but the measured resistance in HCl solutions increases when cobalt is added.

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### References

1. Y. Yoshizawa, S. Oguna and K. Yamauchi, *J. Appl. Phys.* 1998, 64, 6044.
2. M. L. Fernández-Gubieda, I. Orue, J. M. Barandiarán and F. Plazaola, *Proc of the V int. Workshop on Non-Crystalline Solids*, 1997, 172.

Table 1. Onset, peak and Curie Temperatures of F-Co<sub>x</sub> amorphous alloys.

	$T_{onset}$ (°C)	$T_{peak}$ (°C)	$T_{Curie}$ (°C)
Finemet	518,79	536,32	327,74
Fco2	511,85	527,17	362,89
Fco4	523,97	542,17	342,41
Fco6	529,14	547,78	348,63
Fco8	525,53	543,52	356,59
Fco10	525,42	543,06	361,58

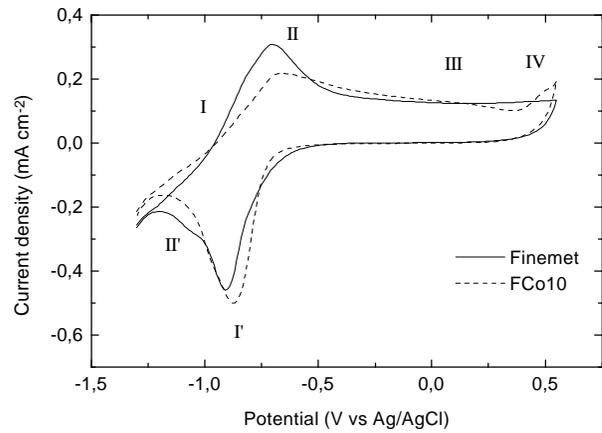


Figure 1: Cyclic voltammogram of the 10<sup>th</sup> cycle registered for Finemet and FCo10 amorphous alloys in KOH 0.5N. Scan rate: 20 mV s<sup>-1</sup>.

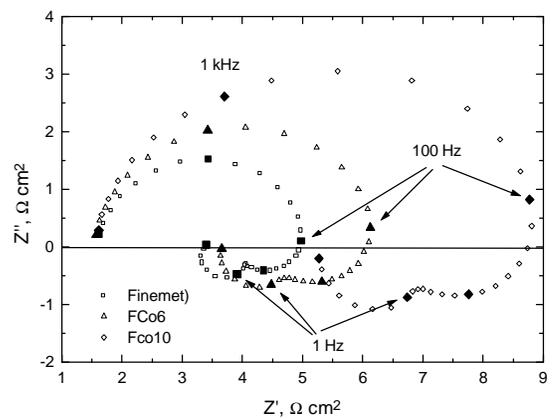


Figure 2: Nyquist plots of FinemetX alloys in HCl 2N. Bias: -200 mV Ag/AgCl.