

iv iii ii i

(SEM)

## *An investigation of solid phase distribution in metal foam produced by casting*

M. Dayani ; J. Zamani; M.H. Siadati and M. Ghiasvand

### **ABSTRACT**

One of the methods to produce metal composite foam is casting around ceramic or metallic hollow spheres. The main problem in this method is the melt penetration between hollow spheres. In this research metal foam was produced by casting around ceramic hollow spheres. Ceramic hollow spheres were produced by sodium silicate binder and fire clay. Ceramic hollow spheres were molded in random and ordered arrangements. Ceramic hollow spheres were arranged in two various arrangement by thin wire steel meshes. In various arrangements, the molten penetration between hollow spheres was studied and observed that arrangement affects on melt penetration between hollow spheres. The interface between ceramic hollow spheres with aluminum matrix and steel mesh wires with matrix were verified by SEM. Steel wires have partial joining in interface with aluminum, while there is a separation between ceramic hollow spheres and matrix in interfaces.

**KEYWORDS :** Metal foam, Ceramic hollow sphere, Hollow spheres arrangement, Melt penetration, Solid phase distribution

---

// :  
/ / :

i

m.dayani86@gmail.com

ii

iii

iv

(SEM)

EDX-SEM

[.]

۲-۱-۱- مواد مصرفی

[.] [.] [.]

%  
%  
%

[.] [.] [.]

%  
%  
[.] [.]

pH /

%  
%

% /

pH /

[.]

$\mu\text{m}$

[.]

mm

A356

( )

A356

( )

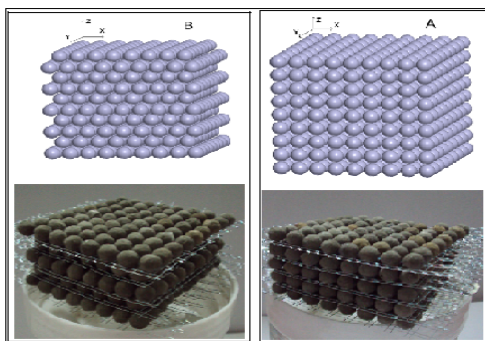
Al	Cr	Cu	Mn	Fe	Mg	Si	
	/	/	/	/	/	/	



A /  
 B (SC)  
 ( ) (BCC)  
 ( ) °C  
 / mm  
 / mm HZ  
 °C  
 / mm Z mm Y X ° C/minute  
 °C  
 ST37 °C  
 ( × × )( × × cm) °C  
 °C  
 cm× cm

( )

[ ]



A356 °C  
 °C % / mm / mm  
 °C / mm  
 μm μm

mm

A

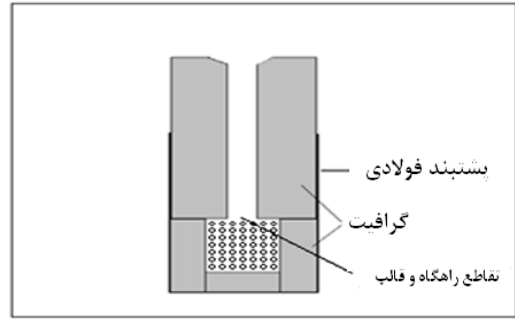
B

( )

Y X

B A

SEM / mm  
 / gr  
 mm/minute rpm  
 rpm rpm



( )

MV2300  
 EDX

( )

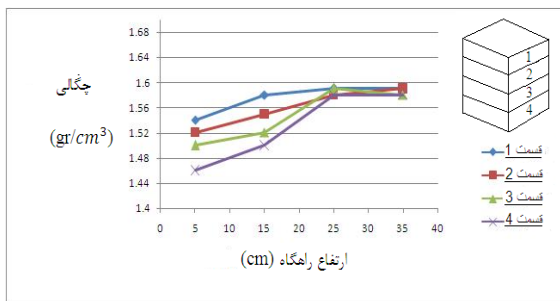
	(cm)			
A				
B				

( × × )( × × cm)

B A

, cm

( ) ( ) ( )



( )

( )

A



/ / / /

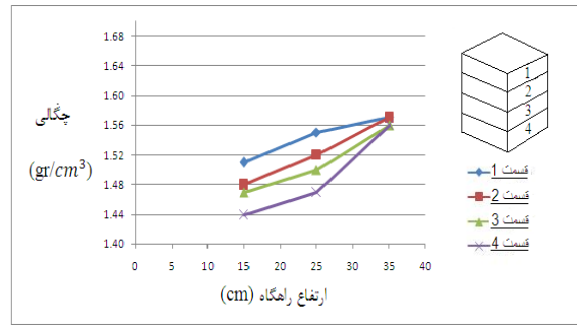
B

A

( )

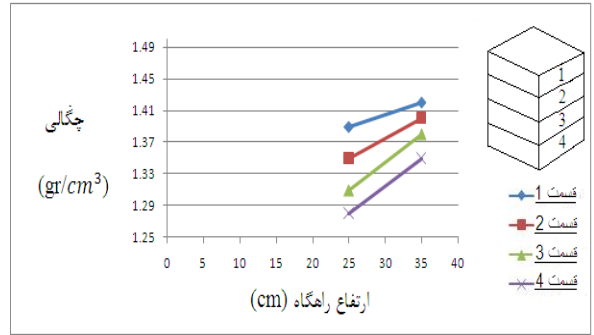
B

A



( )

B



( )

A

cm cm

( )

B

cm

cm

cm

cm

B

cm

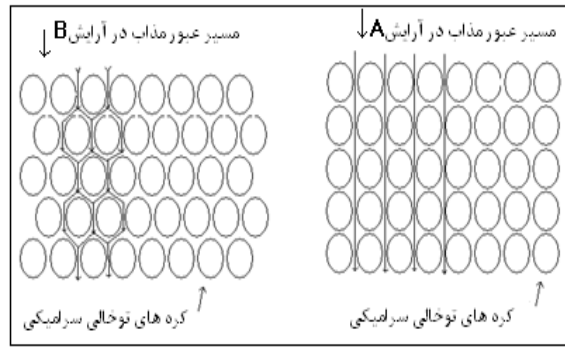
( )

A356  
A356

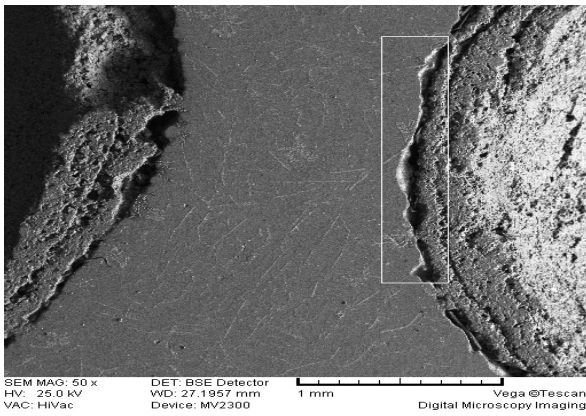
Aswan . [ ]

[ ]

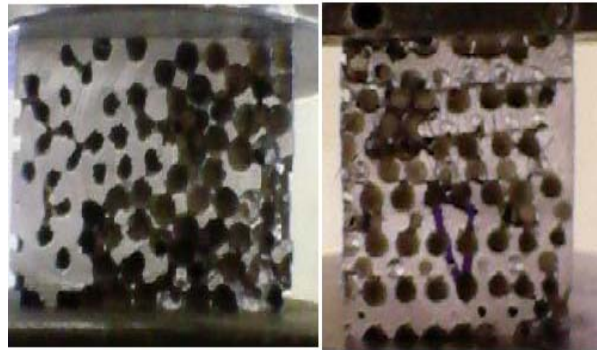
[ ]



( )



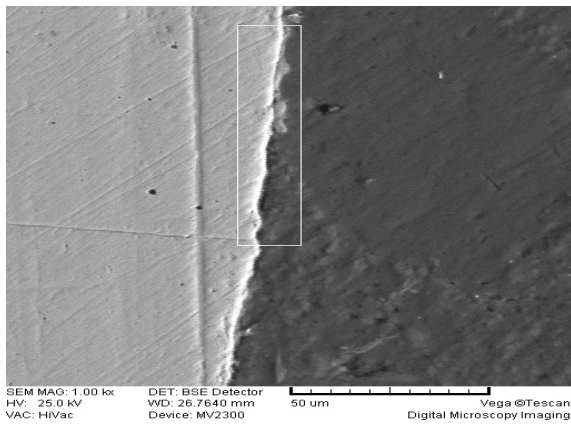
( )



( )

(B )

SEM ( )



( )

( )

SEM-EDX

A356

Shih .



- Lakshmi, J. Vendra, A. Rabiei. "A study on aluminum-steel composite metal foam processed by casting". *Materials Science and Engineering A*, 465, 59–67, 2007. [ ]
- W.S. Sanders, L.J. Gibson. "Mechanics of hollow sphere foams". *Materials Science and Engineering*, A347,70 - 85, 2003. [ ]
- ASM handbook, casting, volume 8, 1998. [ ]
- T.S.Shih,S.H.Tu "Interaction of steel with pure Al,Al-Si and A356alloys". *mater.sci.& Eng. A*454, 349-356, 2007. [ ]
- G.H.Awan,F.U.Hasan,"The morphology of coating/substrate interface in hot- dip- aluminized steels".*Mater.Sci.A*427,pp.157-165 ,2008. [ ]
- J. Banhart . "Manufacture, characterisation and application of cellular metals and metal foams", *Progress in Materials Science*,Vol.46, pp.559-632, 2001 [ ]
- V.C. Srivastavs, K.L. Sashoo."Processing, stabilization and applications of metallic foams". *Art of science Materials Science-Poland*, Vol. 25, No. 3, 2007. [ ]
- A. E. Simone and L. J. Gibson. "Effects of solid distribution on the stiffness and strength of metallic foams". *Acta mater.* Vol. 46, No. 6, pp. 2139-2150, 1998. [ ]
- E. Andrews, W. Sanders, L.J. Gibson . "Compressive and tensile behaviour of aluminum foams". *Materials Science and Engineering*, A270, 113–124, 1999. [ ]
- A. Rabiei, A.T. O'Neill. "A study on processing of a composite metal foam via casting". *Materials Science and Engineering A* 404, 159–164, 2005. [ ]