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(// , // // //)

چکیده

(IF)

(BH)

واژه های کلیدی: پخت سختی - فولادهای عاری از عناصر بین نشین - تصویر قطبی - بافت

مقدمه

$(\%N < 0.0040, \%C < 0.0030)$

{ }

[]

[]

(\bar{r}_m)

[]

/

[]

()

(VAR)

V Nb Ti
°C

[]

{ } { }

(r_m)

°C

°C

%

°C

[]

[]

(r_m)

°C/hour

X' Pert

[]

{ } { }

ODF

%

{ }

{ }

X' Pert

{ }

%

Bang

(r_m)

I{ }/I{ }

%

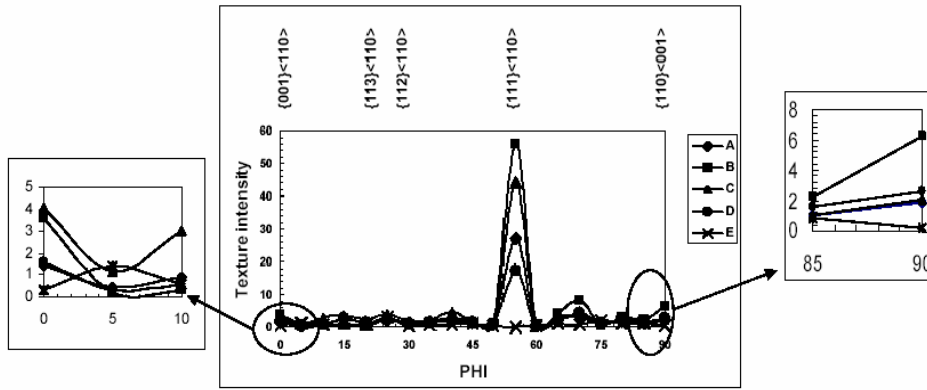
{ }

ASTM-B557M

روش پژوهش

IF

Steel	%C	%N	%S	%P	%Ti	%Nb	%V	%Mn	%Si
A	0.0070	0.0040	0.0013	0.0035	0.040	-	-	0.036	0.0046
B	0.0069	0.0040	0.0013	0.0036	-	0.039	-	0.034	0.0042
C	0.0074	0.0046	0.0040	0.0033	0.014	-	0.031	0.035	0.0040
D	0.0080	0.0085	0.0030	0.0060	0.040	-	0.040	0.040	<0.01
E	0.0080	0.0047	0.0040	0.0060	0.040	-	0.050	0.050	<0.01



شکل ۱: مقایسه تغییرات شدت فیبرهای RD برای پنج فولاد.

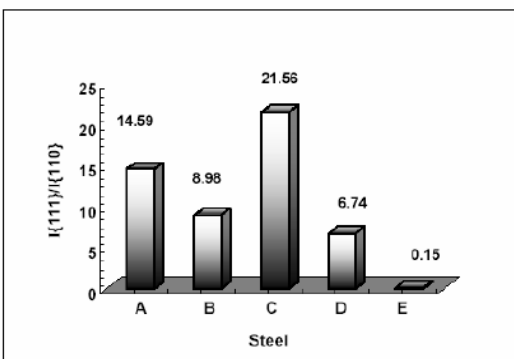
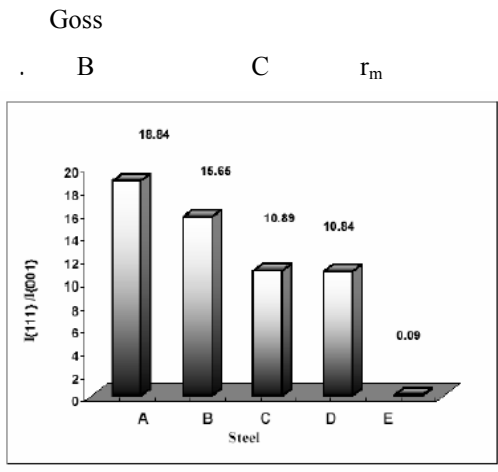
$\{ \quad \} < \quad >$
 (Goss) $\{ \quad \} < \quad >$ ° C
 B
 $\{ \quad \} < \quad >$
 Goss
 °C/Sec
 E C
 % %
 ° C

Steel	r ₀	r ₄₅	r ₉₀	r _m	Δr
A	2.11	1.92	2.45	2.1	0.18
B	1.8	1.3	2.71	1.77	0.47
C	1.89	2.25	1.409	1.95	-0.3
D	2.11	1.28	2.127	1.69	0.41
E	1.43	0.98	2.40	1.44	0.46

نتایج و بحث

1/Sec
 (LC) IF (ULC)
 : [.]
 (RD) α -
 < >
 A (ND) γ -
 < >
 ε -
 ND RD
 < > TD
 ()
 B φ RD
 B ()
 C A B
 (. C A B r_m) E { } < >

{ } C
 { } () { }
 % / () C B $\frac{I\{111\}}{I\{001\}}$
 ()
 % / C B A
 B { }
 C { } { }
 A

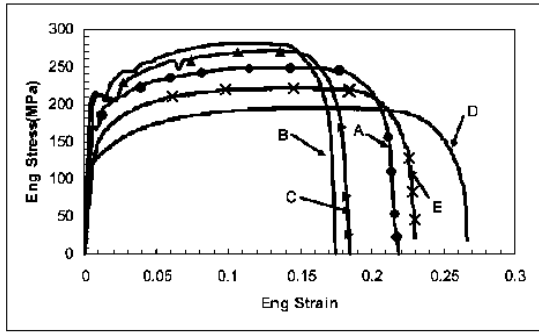


B C r_m
 ()
 C B $\frac{I\{111\}}{I\{001\}}$
 ()
 C r_m B
 Goss
 ({ } < >)
 { } :
 { }
 () []
 Goss { }
 ($\frac{I\{111\}}{I\{110\}}$)
 C
 Goss C
 { }
 B C r_m
 ()
 { } ()
 { }
 { }
 { }
 () C A
 () { }
 A r_m
 B r_m
 $\frac{I\{111\}}{I\{001\}}$
 $\frac{I\{111\}}{I\{110\}}$
 r_m

B ()
 Nb ND
 Nb(C,N) B { } < >
 [] Ti(C,N) ()
 ()
 °C/Sec Goss

B { }
 Goss
 C, A B

Nb(C,N)
 ()



% - :

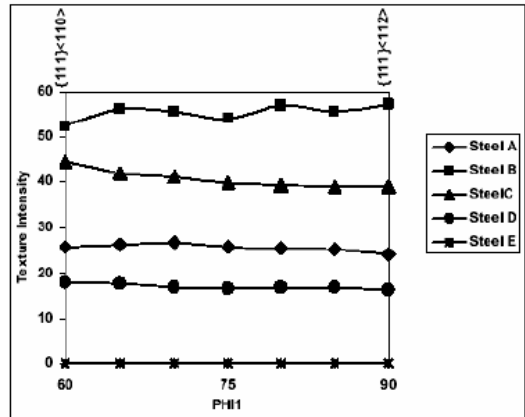
.BH

UTS YS

()

D

D



ND

آزمایش پخت سختی

()

%

D

B

BH

[]

BH

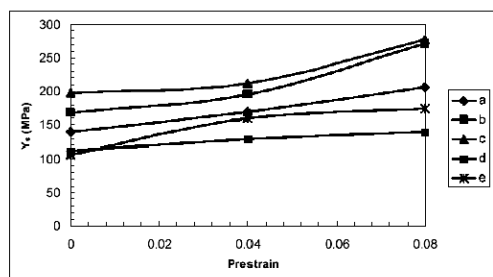
BH

Ti₄C₂S₂ TiN

) (()

B D A E C

BH



.BH

BH

B

B

Ti(C,N)
V(C,N) Nb(C,N)
D
V(C,N)
Ti(C,N)

V
E
V
Ti
V(C,N)
D

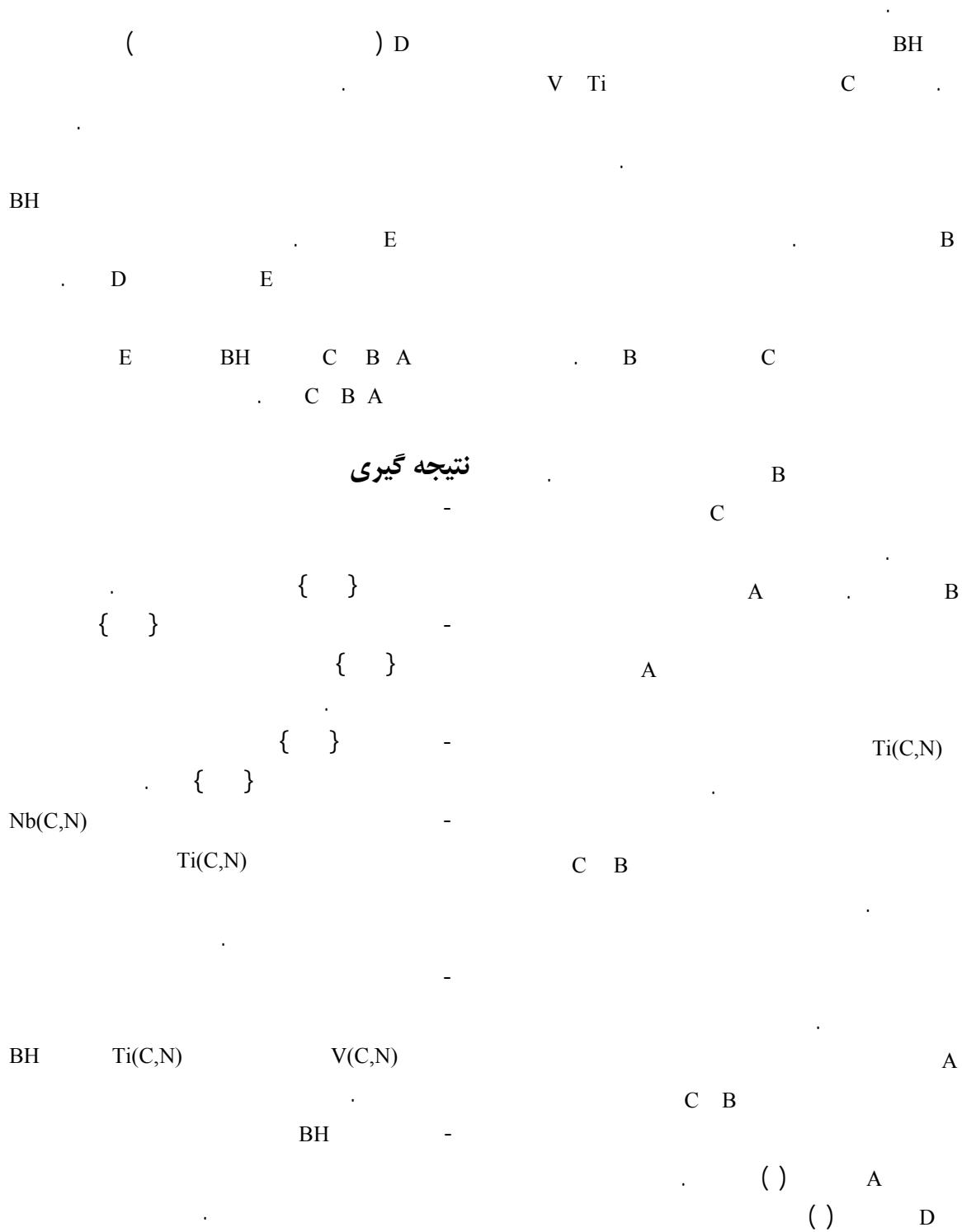
V(C,N)
Ti(C,N)
D BH E

D (C + N) E

E V
Ti
C D E []

D E
E

D C
D E C A E
A
) E D C



مراجع

1 - Jeong, W. C. (1999). "Strength and formability of ultra-low carbon Ti-IF steels." *Metall. and Mater. Trans. A*, Vol.31A, PP.1305-1307.

- 2 - Hoile, S. (2000). "Processing and properties of mild interstitial free steels." *Mater Sci. and Tech.*, Vol. 16, PP. 1079-1093.
- 3 - Wang, Z. C. and Wang, X. (2001). "A new technology to improve the r-Value of interstitial-free (IF) steel sheet." *Material processing technology*, Vol.113, PP.659-661.
- 4 - Held, J. F. (1965). "Mechanical working and steel processing." *Paper 3, The metallurgical society of AIME*, Newyork.
- 5 - Zhao H., Rama, S. C., Barber, G. C., Wang, Z. and Wang, X. (2002). "Experimental study of deep drawability of hot rolled IF steel." *Material processing Technology*, Vol.128, PP.73-79.
- 6 - Martinez, V. J., Verdeja, J. I. and Pero-sanze, J. A. (2001). "Interstitial free steel, Influence of α -phase hot rolling and cold rolling reduction to obtain extra-deep drawing quality." *Material characterization*, Vol.46, PP.45-53.
- 7 - Seidal, L., Holscher, and Lucke, K. (1989). "Textures and Microstructures of metals." *Text Microsty.* Vol.11, PP.171-185.
- 8 - Hudd, R. C. (1991). "Processing, cold working and annealing." *Mater. Sci. and Tech*, Vol.7, PP.219-284.
- 9 - Li, B. L., Cao, W. Q., Liu, Q. and Liu, W. (2003). "Flow stress and microstructure of cold-rolled IF-steel." *Mater. Sci. and Eng A*, Vol.356, PP.37-42.
- 10 - Sang, H. L. and Dong, N. L. (1998) "Shear rolling and recrystallization textures of interstitial-free steel sheet." *Mater. Sci. and EngA*, Vol.249, PP.84-90.
- 11 - Zhang, Y. D., He, C.S., Wang, Y. N., Zhao, X., Zuo, L. and Esling, C. (2003). "Texture and microstructure development in cold-rolled interstitial free (IF) steel sheet during electric field annealing." *Scripta Materialia*, Vol.48, PP.737-742.
- 12 - Toroghinejad, M. R., Humphreys, A.O., Liu, D., Ashrafizadeh, F., Najafizadeh, A. and Jonas, J. J. (2003). "Effect of rolling temperature on the deformation and recrystallization textures of warm-rolled steels." *Metallurgical and material transaction A*, Vol.34, PP.1163-1174.
- 13 - Barrett, C. J., Wilshire, B. (2002). "The production of ferritically hot rolled interstitial-free steels on a modern hot strip mill." *Mater. Proc. and Tech*, Vol.122, PP.56-62.
- 14 - Dehghani, K. and Jonas, J. J. (2000). "Dynamic Bake hardening of interstitial-free steels." *Metallurgical and Materials Transaction A*, Vol.31A, PP.1375-1383.
- 15 - Wilshynsky, D. O., Matlock, D. K. and Krauss, G. (1994). "Recrystallization of IF steels." *International forum for physical metallurgy of IF steels*, PP.130, Tokyo.

واژه های انگلیسی به ترتیب استفاده در متن

- 1 - Bake Hardening (BH)
- 2 - Interstitial Free Steels (IF)
- 3 - Vacuum Arc Remelting (VAR)
- 4 - Stress Relief
- 5 - Batch Anneal
- 6 - Orientation Distribution Function
- 7 - Pole Figures
- 8 - Low Carbon Steels (LC)
- 9 - Ultra Low Carbon Steels (ULC)
- 10 - Pinning