



## Analysis Report

### AlCr=70/30at% target of GfE & SHMT

**Issued lab:** The Chinese State Key Lab (SKL) of new Materials in  
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**Remark:** The following analysis result is for reporting both the same and different features of AlCr=70/30at% target made by GfE & SHMT. The key quality specification of density, micro grain structure, chemical composition and also coating performance for sputtering target are included.

**Sample A:** Made by GfE Metalle und Materialien GmbH

**Sample B&C:** Made by Hebei Shenghua New Materials Technology Co., Ltd.

#### Density

Sample	Manufacturer	Actual Density (g/cm <sup>3</sup> )	Actual Density by percent
A	GfE	3.77	100.2%
B	SHMT	3.76	100%
C	SHMT	3.77	100.2%

Remark:

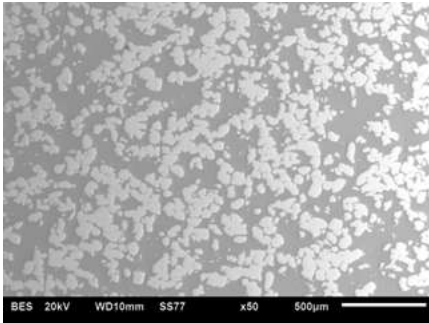
1) The theory density for AlCr=70/30at% target made by HIP is 3.76g/cm<sup>3</sup>. The reason for the actual density is higher than the theory density is that both Cr and Al atom are diffused each other.

2) Density by percent means (actual density/theory density) x 100%

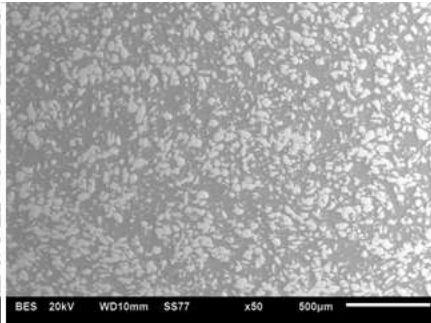
3) Sample C was made from much finer Cr powder than Sample A & B.



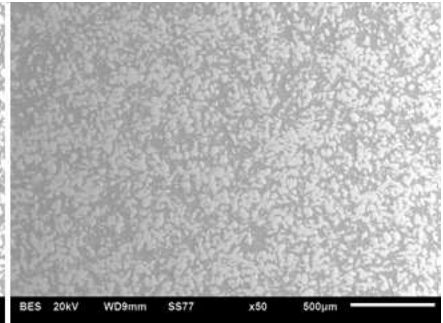
### Micro grain structure



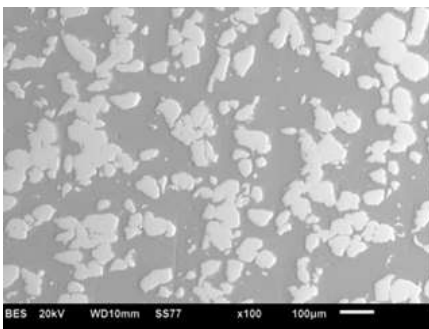
GfE (X50) Sample A



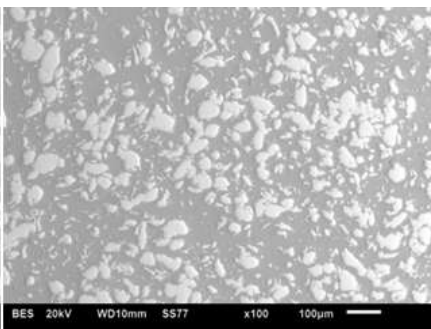
SHMT (X50) Sample B



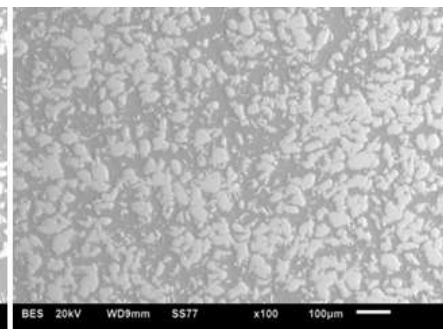
SHMT (X50) Sample C



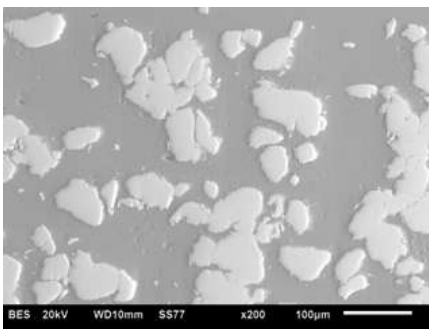
GfE (X100) Sample A



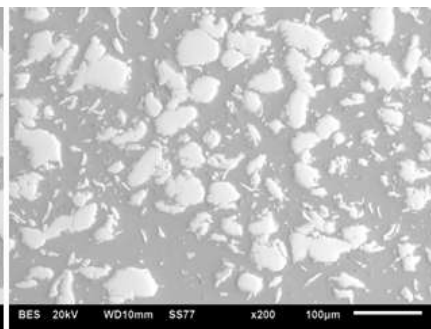
SHMT (X100) Sample B



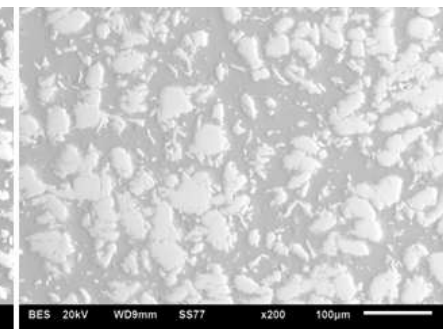
SHMT (X100) Sample C



GfE (X200) Sample A



SHMT (X200) Sample B



SHMT (X200) Sample C

#### Remark:

- 1) The above micro structure pictures are observed by SEM(scanning electron microscope) with back scattering mode. The bright parts means Chromium and The Dark parts means Aluminum.
- 2) Obviously, GfE's Cr grain is bigger than SHMT's. And sample C from SHMT has the Cr grain below dia. 50um.



**Chemical Composition in wt%**  
**AlCr 70/30at% = AlCr 54.77/45.23wt%**

Sample	Magr.	Al	Cr	C	N	O	S	Fe	Si
A	GfE	54.64	Balance	0.05	0.04	0.13	0.005	0.13	0.12
B	SHMT	54.62	Balance	0.06	0.05	0.14	0.005	0.12	0.10
C	SHMT	54.59	Balance	0.06	0.06	0.15	0.005	0.13	0.09

The above analysis result means both GfE and SHMT's chemical composition are in the same level.

### Coating Result Comparison



Remark:

1) The coating film of SHMT's target is darker and brighter than GfE's.



- 2) SHMT's target is from normal production of Sample B but not C.
- 3) The Cr powder grain size from SHMT's target is smaller than GfE's, which means there is higher volume fraction for Cr and more  $\text{Ar}^+$  will sputter Cr during deposition process. Because the Cr possess is higher sputtering yield than Al, the sputtering speed of SHMT's target is faster, then lead to thicker coating film, darker band brighter color coating surface than GfE's.

**Conclusion:**

Compared with GfE's AlCr target, SHMT's target has smaller grain size and more uniform grain distribution, which will contribute to get solid coating film and faster coating speed and also higher coating efficiency finally.

The end.