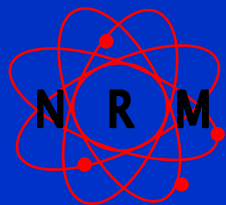


CIGS Solar Cell Material Supply

Nippon Rare Metal, Inc.

December, 2008



NRM has been engaged in the refinement and recovery business of high purity Indium, Gallium and Selenium over the past few decades.

You can count on us from the virgin material supply to the recovery of In/Ga/Se from CIGS scrap!

NRM welcomes your consultation for the recovery from CIGS scrap.

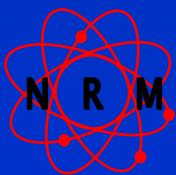
Gallium 4N/6N



Indium granules 4N/5N

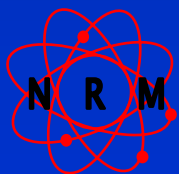


Selenium granules/pellets 4N/5N



Standard Specifications of Indium, Gallium and Selenium for CIGS

														unit: ppm
Indium 4N														
Element	Al	Bi	Cd	Cr	Cu	Fe	Hg	Ni	Pb	Sb	Sn	Tl	Zn	
Impurity limit	≤5	≤5	≤5	≤5	≤5	≤5	≤5	≤5	≤10	≤5	≤10	≤5	≤5	
Typical Data	1	<3	1	<1	2	1	<1	1	5	<3	6	<5	<1	
Gallium 4N														
Element	Ag	As	Cd	Cr	Cu	Fe	Ge	Hg	In	Mg	Ni	Pb	Sn	Zn
Impurity limit	≤5	≤5	≤5	≤5	≤10	≤5	≤5	≤5	≤10	≤5	≤5	≤5	≤5	≤5
Typical Data	<1	<3	1	<1	8	<1	0.2	<1	6	<1	<1	3	<3	<1
Gallium 6N														
Element	Al	Si	Ca	Fe	Cu	Zn	In	Sn	Pb					
Impurity limit	<0.1	<0.2	<0.05	<0.05	<0.05	<0.05	<0.1	<0.1	<0.05					
Selenium 4N														
Element	Al	As	Bi	Cd	Cr	Cu	Fe	Te	Hg	Ni	Pb	Sb	Zn	
Impurity limit	≤5	≤5	≤5	≤5	≤5	≤5	≤5	≤10	≤5	≤5	≤5	≤5	≤5	
Typical Data	<1	<3	<3	<1	<1	<1	<1	3	<1	<1	<3	<3	<1	
Selenium 5N														
Element	Ag	Al	As	Au	Bi	Cd	Cr	Cu	Fe	Ge	Te			
Impurity limit	<1	<1	<3	<1	<3	<1	<1	<1	<1	<1	<1			
Element	Hg	In	Mg	Ni	Pb	Sb	Si	Sn	Tl	Zn				
Impurity limit	<1	<3	<1	<1	<3	<3	<1	<3	<5	<1				



Recovery from CIGS scrap Flow Chart (sample)

