

MAKING STANDARD GRADE FeSiMn ALLOY BY BLENDING OF DIFFERENT LOW MANGANESE CONTAINING MATERIALS

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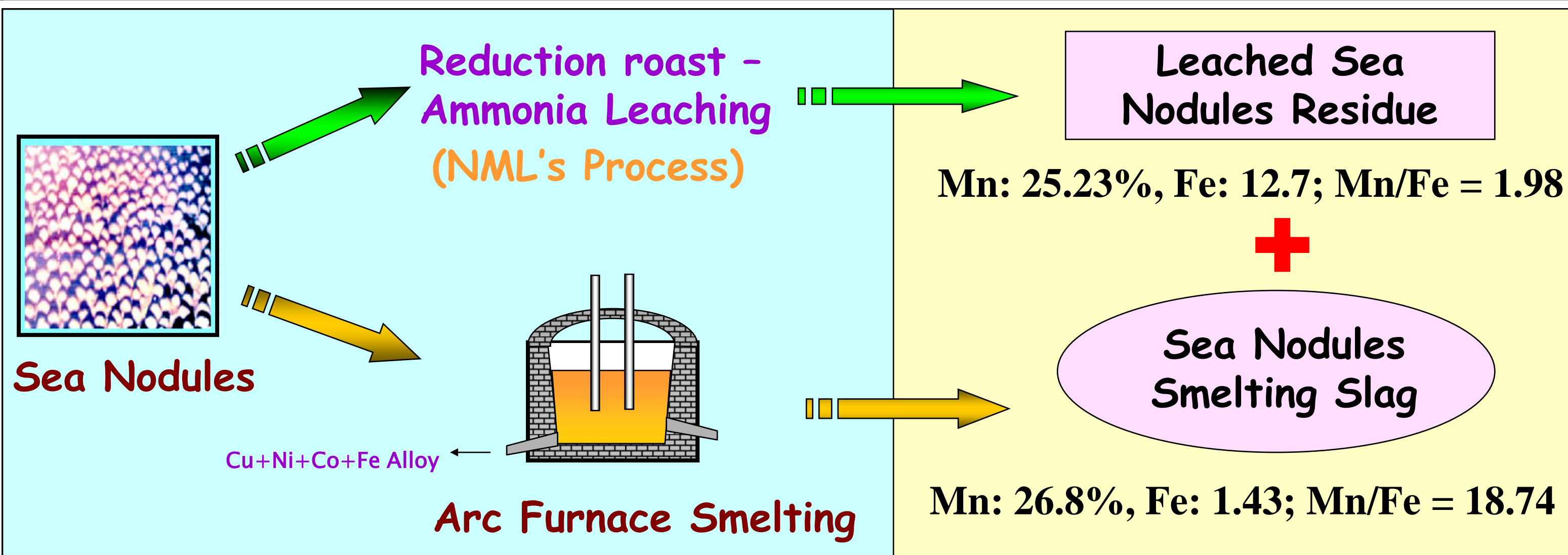
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OBJECTIVE: Blending of sea nodules leach residue with sea nodules smelting slag to maintain suitable Mn/Fe ratio for subsequent smelting in arc furnace to produce standard grade FeSiMn .

BACKGROUND: NML has developed a process for extraction of Cu, Ni, & Co from sea nodules by reduction roast - ammonia leaching - solvent extraction - electrowinning route on pilot scale. This process generates leach liquor (Cu, Ni & Co) and a fine residue having low Mn/Fe ratio (not suitable for direct silicomanganese smelting). The utilization of huge quantity of leached residue is therefore, a matter of great concern. Development of another process of direct smelting of sea nodules in arc furnace to separate Cu, Ni & Co in alloy is being carried out which generates Mn rich slag with high Mn/Fe ratio. In this endeavor these two low Mn containing materials are blended to have suitable Mn/Fe ratio and smelted in 50 KVA DC arc furnace to produce standard grade FeSiMn alloy.

MATERIALS & METHODS

RESULTS & DISCUSSION



SMELTING CONDITIONS
 50 KVA DC Arc Furnace
 Holding time : 60 minutes
 Temperature: ~1600°C



SMELTING

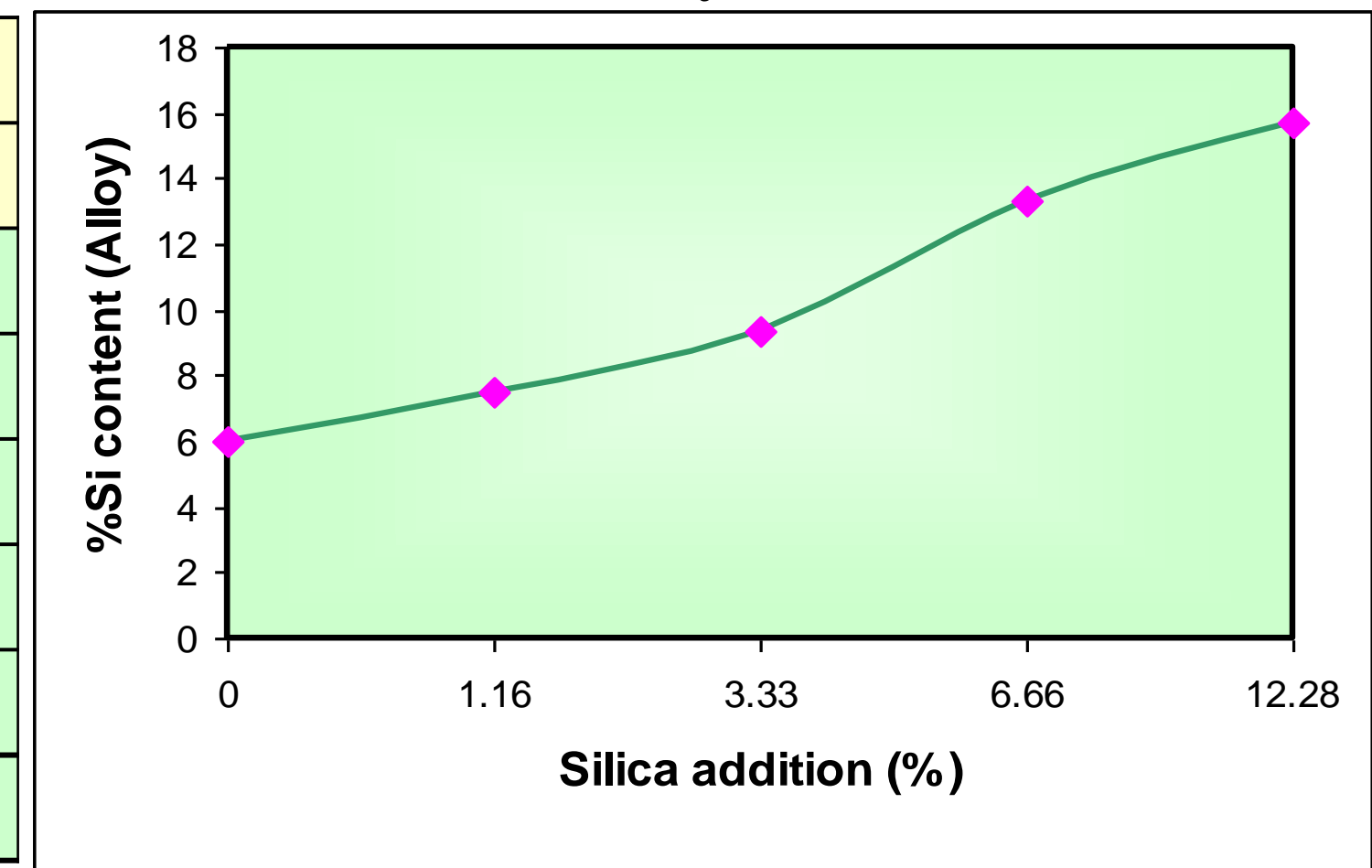
CHARGE MATERIAL

- Blended slag + residue
- Coke
- Quartz
- Dolomite

Table - 1: Chemical composition of Target and Produced FeSiMn alloy

%	IS:1470, 1990	Alloy composition	
		1:0.7	1:1
Mn	60-65	64.1	65
Si	14-18	12.4	15.7
C (max)	2.5	2.85	1.7
S (max)	0.03	0.01	0.008
P (max)	0.3	0.21	0.22
Fe	15-20	20.2	14.8

Fig. 1: Effect of Silica addition on Si content in alloy



Smelting was carried out in 50KVA DC Arc Furnace consisting graphite crucible as Cathode and graphite electrode as Anode. The temperature of the melt was kept around 1600°C to facilitate reduction of SiO₂ along with manganese and iron oxides. The chemical analysis of alloy produce by smelting of blended charge is given in Table - 1. It is evident that standard grade ferro-silico-manganese (FeSiMn) alloy was produced with the smelting of charge mix having blending ratio of 1:1. There was low silicon in alloy with charge of 1:0.7 blending. Therefore, quartz addition was varied and its effect on Si content in alloy was studied, which is graphically represented in Fig. 1. A maximum 75% manganese recovery in FeSiMn alloy was achieved with blending ratio of 1:1.

CONCLUSION: Standard grade FeSiMn alloy could be produced from low manganese containing materials.