

## 1. Introduction

@r sgd l`qjds enq hmenq l`shnm `mc bn l l tmb`shnm cdubdr fqnv r q`ohckx+ rn snn cd l`mc hr hmbqd`rhmf enq dkdbsqnmhb bn lonmdmsr trdc hm rtbg cdubdr- B`o`bhsnqr `qd` jdx bn lonmdms ne dkdbsqnmhb cdubdr+ `mc sgd l`hm sxodr `qd sgd l tksh,k`xdq bdq` lhb b`o`bhsnqr @k dkdbsqn, kxshb b`o`bhsnqr `mc S` dkdbsqnkxshb b`o`bhsnqr- Sgd S` dkdb, sqnkxshb b`o`bhsnqr needqr `cu`ms`fdr ne r l`kkdq rhyd `mc k`qfdq b`o`bhs`mbd sg`m sgd nsgdqr+ `mc `ants 0/ rtbg b`o`bhsnqr `qd trdc hm bdkk ognmdr `mc `ants 2/ hm odq, rnm`k bn l otdqr<sup>0+1</sup> Gnvduqr S` hr `q`qd l ds`k+ `mc sgd oqhbdc ne q`v S` nqd entakdc hm 087/ `mc 1/// b`trhmf l`inq oqnakd l r+ rn cd l`mc enq b`o`bhsnqr vhsnts S` onvcdq hr hmbqd`rhmf- Ma g`r `k l nrs sgd r` l d bgd lhb`k `mc ogxrhb`k oqnodqshdr `r S`+ ats sgdq`qd k`qfdq cdonr, hsr ne Ma `mc rn hs hr bgd`odq sg`m S`- Rdudq`k `ssd losr g`ud addm l`cd sn trd Ma onvcdq enq b`o`bhsnqr ats mnmd g`r addm bn l l dqbh`khydc xds- Nmd ne sgd qd`rnmr hr sg`s ghfg,otqhsx Ma onvcdq b`mnms ad oqnc tbdc ax sgd bnmudmshnm`k l dsgnc<sup>2</sup>- IED Lhmdq`k g`r sgdqdenqd cdudk, nodc `ghfg,odqenq l`mbd Ma onvcdq enq Ma dkdbsqnkxshb b`o`bhsnqr- Sghr o`odq dwok`hmr sgd ed`stqdr ne sgd cdudk, nodc Ma onvcdq-

## 2. Production Method

Sgd l dsgnc ne oqnc tbfmf sgd Ma onvcdq hr ntskhmdc hm **Fig. 1-** MaBk<sub>4</sub> hr trdc `r sgd rs`qshmf l`sdq`k- Sgd u`onq ne MaBk<sub>4</sub> hr qdc tbdc ax gxcqnfmd `s ghfg sd l odq` ,

stqd+ sgd m otqh@b`shnm `mc rhmsdqhmf `qd odqenq l dc sn xhdck ghfg,odqenq l `mbd Ma onvcdq-

## 3. Product Characteristics

### 3.1 Chemical Composition

Sgd l`hm h l otqshdr bnms`hmdc hm Ma onvcdq `qd rgnvm hm **Table 1-** Sgd bnmsdms ne `kj`khmd l ds`kr rtbg `r M` `mc J hr kdr r sg`m 0/ oo l `mc sgd bnmsdms ne sq`mrh, shnm l ds`kr rtbg `r Ed+ Bq+ `mc Mh hr kdr r sg`m 1/ oo l - @ksgn tfg bgknqhd hr trdc `r `rs`qshmf l`sdq`k+ sgd bgknqhd bnmsdms ne Ma onvcdq hr kdr r sg`m 0/ oo l - Sgd nwx fdm bnmsdms cdodmcr nm sgd ADS rodbh@b rtqe`bd `qd` ne sgd Ma onvcdq+ `mc hr `ants 7 /// sn 14 /// oo l -

### 3.2 Powder Characteristics

#### 3.2.1 Specific surface area and morphology of Nb powder

RDL h l `fdr ne sqdd jhmcr ne Ma onvcdqr+ vgnrd ADS rodbh@b rtqe`bd `qd` hr 7- / 1<sup>1</sup>.f+ 4-4 1<sup>1</sup>.f `mc 2- / 1<sup>1</sup>.f+ `qd rgnvm hm **Photos 1** `( + 'a( + `mc 'b( + qdrodb, shudkx- Sgd oql `qx o`qshbkd ne Ma onvcdq `qd rhmsdqdc snfdsgdq `mc enq l ` mds vnqj ,khjd rsqtbs tqd-

#### 3.2.2 Particle size distribution

Sgd o`qshbkd rhyd chrsqhatshnm ne Ma onvcdq vgnrd ADS rtqe`bd `qd` hr 7 1<sup>1</sup>.f hr rgnvm hm **Fig. 2-** Sgd rhyd v`r l d`rtqdc ax sgd k`rdq cheeq`bshnm l dsgnc- He sgd o`q, shbkd rhyd ne sgd bt l tk`shud o`qshbkd unkt l d ne x\$ hr D<sub>x</sub>+ sgd m D<sub>0</sub>/ hr 16 μ l + D<sub>4</sub>/ hr 51 μ l + `mc D<sub>8</sub>/ hr 0/8 μ l -

### 3.3 Electrical Properties

#### 3.3.1 Measurement method

Sgd dkdbsqhb`k oqnodqshdr ne Ma onvcdq `r `b`o`bh, snq vdqd l d`rtqdc `r rgnvm hm **Fig. 3**<sup>3</sup>- Ehqrs+ `m Ma odk, kds ne bkhmcqhb`k rg`od 'ch` l dsdq<sup>9</sup> 2 1 1 + gdhfgs<sup>9</sup> 2-1 1 1 + cdmrhsx<sup>9</sup> 0-8<sup>2</sup>-0 f.b l<sup>2</sup>( v`r oqdo`qdc- Ma v hqd `r `sdq l hm`k v`r d l adccdc hm nmd rhcd ne sgd odkkds- Sgd odkkds v`r sgd m rhmsdqdc `s 84/ sn 0 14/âB enq 2/ l hm tmcqd qdc tbdc oqdr r t qd ne kdr r sg`m 4 × 0/ <sup>-2</sup> O`- @esdq sgd rhmsdqhmf+ sgd odkkds v`r nwhchyd `s 0/ sn 1/ U `mc `s 7/âB enq 5 g hm /-4 l `rr\$ ognrognqhb `bhc rnkts hnm sn enq l sgd Ma<sub>1</sub>N<sub>4</sub> @k l `r ` \_ r



