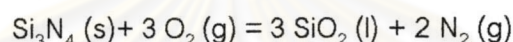


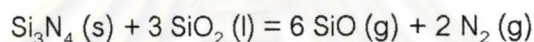
CHAPTER 5

CONCLUSION

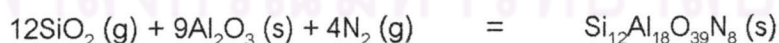
1. Si_3N_4 (Mixed powder B) was successfully sintered in air furnace. The bulk and relative densities after sintering at 1700°C for 2 h were 3.18 g/cm^3 , and 97.6 %, respectively. Small amount of mass loss, 1-2%, was observed. Moreover, two mass change phenomena, mass gain and mass loss, were observed. Mass gain was the result of oxidation.



In contrast, mass loss is presumed to be the reaction with Si_3N_4 and SiO_2 .



2. Hardness and fracture toughness of the Si_3N_4 were 16 GPa and $5\text{ MPa}\cdot\text{m}^{(1/2)}$, respectively. These results are equivalent to TOSHIBA's commercial grade Si_3N_4 .
3. As Si_3N_4 packing powders, SN-7, SN-7 added with BN, SN-E10, SN-KO5, and SN-F2 were tested. SN-E10 and coarse SN-F2 did not show serious agglomeration. However, SN-E10 is very expensive. Thus, SN-F2 is the candidate material for packing powder.
4. A-11 should be used as Al_2O_3 packing powder because A-11 showed weaker agglomeration than AM-21. AM-21 led to hard and strong agglomeration because of small particle size and large surface area.
5. Inside the small Al_2O_3 crucible, there was some reaction product. The reaction was supposed to be as follows.



Big Al_2O_3 crucible cracked after several times of usage.

6. The flexural strength of specimen from mixed powder B sintered at 1700°C , 2 h measured by the method of ASTM F-394 was 420 MPa. This value is relatively low compared to $\sim 600\text{ MPa}$ of commercial Si_3N_4 .