CHAPTER -7

DISCUSSION OF RESULTS – PART C

COMPARISON OF PROPERTIES OF GREEN AND SINTERED COMPOSITES

In this chapter, the comparison of properties between the green (at 300MPa) and sintered composites (at 300MPa and 530°C) is presented.

7.1 GREEN DENSITY AND SINTERED DENSITY

Fig. 7.1 shows a comparison of densities between the green and sintered composites. It is observed that, the density is decreased due to sintering. The sintering of green briquettes results in a decrease in weight and an increase in volume. This may be the reason for the sintered density to be lesser than the green density.

![Fig. 7.1: Comparison of densities of green and sintered composites](image-url)
7.2 TRUE POROSITY AND SINTERED POROSITY

The comparison of %true porosity and %sintered porosity of green and sintered samples respectively is shown in Fig. 7.2. There is an increase in the sintered porosity in comparison to the true porosity of green briquettes. This is due to increase in volume of the compact owing to sintering.

![Comparison of % Porosities of Green and Sintered Composites](image)

Fig. 7.2: Comparison of % porosities of green and sintered composites

7.3 GREEN HARDNESS AND SINTERED HARDNESS

The comparison between the harnesses of the green and sintered composites is shown in Fig. 7.3. By comparing both hardness values of the green and sintered composites, it can be accomplished that there is a decrease in the hardness on sintering for all compositions.
During the sintering of the green briquettes, the effect of sintering temperature on the hardness is two-fold.

(a) There may be an increase in hardness due to diffusion of atoms at the points of contact which may result in formation of new phases and intermetallics.

(b) A decrease in hardness may be observed due to relief of residual stresses of powder particles deformed severely during the application of compaction pressure.

The final hardness of the sintered compact is determined by the net effect of these two counteracting phenomenon.

![Fig. 7.3: Comparison of hardness of green and sintered composites](image)
7.4 GREEN AND SINTERED COMPRESSIVE STRENGTHS

Fig. 7.4 shows a comparison between green and sintered compressive strengths. On comparison of sintered compressive strength values with the corresponding green strength values, it is clear that the sintered strength is improved for all compositions. This is due to the atomic diffusion which raises the bonding of particles and the liquid phase bonding of Al and fly-ash particles by the molten Pb which melts at lower temperature than those of Al and fly-ash particles.

Fig. 7.4: Comparison of green and sintered compressive strengths

7.5 APPLICATION OF Al-Pb/FLY-ASH COMPOSITE

The bush manufactured from Al-Pb/10wt%fly-ash composite compacted at 400MPa and sintered at 560°C is shown in Fig. 7.5.
7.5.1 Weight Loss (%) of Bush

The % weight loss of the bush after 5 hours of rotation at 890rpm is shown in Fig. 7.6. As the fly-ash is increased from 0 to 5wt% the weight loss decreases and this is due to increase in hardness of the material with the increase in fly-ash content. During rotation of the bush, the fly-ash particles get exposed due to matrix abrasion and offer resistance to wear. With further increase of fly-ash from 5 to 10wt%, the weight loss is increasing and this is as a result of decrease in strength of the composite with the increase in fly-ash content.

![Weight loss (%) of the bush](image)