Rice husk has been used as the raw material for the production of a series of silicon-based ceramic materials. Initially, characterizations of rice husk were done. These characterizations include chemical analysis, TG/DSC, XRD, SEM and FTIR analysis. Characterizations of the silica obtained from raw and acid-treated rice husk have been carried out through XRD, FTIR, SEM and EDX analysis. Effect of temperature on phase transitions of silica was studied from XRD analysis. Non-oxide ceramics (SiC, Si$_3$N$_4$ and Si$_2$N$_2$O) were synthesized using rice husk as
raw material. Additives like Fe, Si and Ni were used to study the improvement of % yield, morphology, etc., on the product materials. The product materials have also been optimized by varying temperature and concentration of the additives.

The research work conducted so far and reported in this thesis offers plenty of scope for further studies in the future as outlined below:

1. Silicon-based ceramics (SiO₂, SiC, Si₃N₄ and Si₃N₂O) composite powder produced from rice husk can be scaled up to 100 g for the further analysis.
2. Optimization of each phase can be done by varying different parameters such as temperature, holding time, % of various additives, etc.
3. Further experiments and characterizations such as TEM, surface area, pore-size analysis, etc., can be done to obtain nano-sized and pure form of silica powder. This pure silica can be further converted to silica gel.
4. Pure form of silicon carbide powder can be obtained by using arc-type furnace. As prepared, silicon-based composite powder can be kept in liquid nitrogen, alone, then it can be mechanically ball-milled for different timings and its TEM, XRD, SEM and other characterizations can be done to obtain the nano-sized SiC.
5. As prepared, silicon-based composites powder can be mechanically alloyed with aluminum/stainless steel/copper or any other metal/alloys and its TEM, XRD, SEM and other characterizations can be done to find out the nano-metric dispersion size distribution.
6. Above-mentioned alloyed and milled powders can be cold-compacted at different pressure ranges, 200-600 MPa.
7. Sintering can be done under different atmospheres like hydrogen, nitrogen or argon, etc., and their impact on sintering density and densification parameter can be further improved up to 99% by hot-compacting/hot isostatic pressure (HIP) method. These sintered pellets can be subjected to tensile, compression and impact hardness at high temperature tests.
8. Oxidation resistance and corrosion resistance tests under different atmospheres can be carried out.
9. Above-mentioned white ash having silica, produced from the process, can be used for aluminum matrix composite using stir-casting route; the produced MMC can be further characterized and its mechanical properties can be studied by tests for tensile strength, compressive strength, impact strength, etc.