Chapter 5
Conclusions

The main finding of this research is sequentially concluded as effect of dopants on the physical properties, microstructure, piezoelectric, photovoltaic, photostrictive properties and optical absorption edge of PLZT (3/52/48) ceramics. They are as follows:

1. Small amount of dopants (0.5 at%) is found to have no significant effects on the relative density, grain size, and tetragonality of the PLZT ceramics.

2. Small amount of dopants (0.5 at%) is found to have no significant effects on dielectric and piezoelectric constants. Dielectric constant of the samples in this study is found to be in the range of 1308 to 1647, and piezoelectric constant in the range of 300 to 395 $x10^{-12}$ m/V.

3. The photovoltaic effect in PLZT ceramics is remarkably raised by all the types of doping, ie donor B-site (W^{6+}, Nb^{5+}), donor A-site (Gd^{3+}, Y^{3+}, Bi^{3+}) and isovalence (Ba^{2+}, Sr^{2+}, Se^{4+}, Sn^{4+}) but not to the same extent. The maximum photovoltaic power is found with Ba^{2+} doping.

4. Photovoltage is a main function of photostriction and linearly relates with it.

5. The photo-induced strain or photostriction of the undoped PLZT is 1.86 x 10^{-5}. After doping with 0.5 at% Ba^{2+}, it is raised to 3.34 x 10^{-5} which is the maximum of all doping.

6. High figure of merit for photovoltaic response speed is found with Nb^{5+}, Ba^{2+} and W^{6+} doping respectively.

7. The optical absorption edge of undoped PLZT (3/52/48) is shifted from 375 nm to 390 nm after doping with 0.5 at% Cu^{2+} and W^{6+}.