CHAPTER V
CONCLUSIONS

Characterization of several polyimide films, such as semirigid BPDA-PPD, semiflexible PMDA-ODA and flexible BTDA-ODA/MPD with a variety of techniques have found many appropriate properties for the protective polymer on the backside of micromachined gas sensing devices. The study started with the curing conditions for the imidization process of poly(amic acid) precursors. The full imidization can be achieved above the final curing temperatures of 300°C. However, the usual curing temperature to make sure that the film was totally imidized was 400°C. The curing time can affect the expansion temperature of the flexible film BTDA-ODA/MPD because of the possibility of cross-linking of the flexible chain. With thermal stabilities around 600°C this can fulfill the thermal design objective for this application. Unfortunately, the expansion behavior of the film was not matched by that of the silicon substrate. Therefore, there is a danger of film delamination during the rapid thermal heating of the device needed for the platinum film CVD process. Even the semirigid rod like BPDA-PPD had the lowest in-plane CTE (18×10^{-6} /°C) but its out-of-plane CTE was higher than the out-of-plane CTE of the more flexible chain polyimide films.

A simple and economic fabrication technique for the film was implemented which consisted of suspending a drop of poly(amic acid) precursor above the substrate and applying it by hand. The low viscosity of the BTDA-ODA/MPD PAA seemed to be the best precursor for this application.

The dielectric properties of several polyimide films were measured by the dielectric breakdown voltage which had values comparable with the good insulating polymer, polyethylene. The low dielectric constant and the dissipation factor of the polyimide meets the requirements for the microelectronic application.