CHAPTER IV
CONCLUSIONS

In this thesis work, spirosilicates were successfully synthesized directly via the one step process from very inexpensive material, silica, SiO_2, and ethylene glycol, EG, or its derivatives in the presence of triethylenetetramine, TETA, as catalyst/solvent with/without potassium hydroxide, KOH, as co-catalyst. The reaction conditions including the EG or its derivatives quantity, the reaction temperature, the reaction time, concentration of catalyst, TETA, and co-catalyst, KOH, were found to influence the characteristics of the products.

In addition, in the case of bis(ethane-1,3-diyldioxy)silane, when KOH less than 10 mole percent equivalent to silica was added, the reaction time was reduced from 18 to 10 hours due to the strong base KOH, which pulls proton from ethylene glycol or its derivatives faster than the weak base TETA. Moreover, when fumed silica was employed, the reaction time was also reduced from 18 to 6 hours and from 10 to 4 hours for the reaction without and with KOH as a co-catalyst, respectively. This is due to the higher surface area of fumed silica resulting in higher reactivity.

As for bis(2-amino-2-methylpropane-1,3-diyldioxy)silane and bis(3-amino propane-1,2-diyldioxy)silane products, TETA was used as both catalyst and solvent with/without KOH less than 10 mole percent equivalent to silica, as a co-catalyst. As expected KOH reduced the reaction time from 24 to 14 hours for bis(2-amino-2-methylpropane-1,3-diyldioxy)silane and 14 to 10 hours for bis(3-amino propane-1,2-diyldioxy)silane.