Chapter-6

Chapter 6

Conclusions and Future Scope

6.1 Conclusions

There is huge range of synthetic polymeric materials available for different applications. PVC is one of the most common materials frequently used in medical field. However, inflammations, microbial infections like problems arise due to the interaction of PVC with the biological system. This produces hindrances for its use in medical devices. Functionalization of PVC and its composites is considered to be an important approach for the improvement of blood and cellular biocompatibility. It is also studied that LDH/nanoclay when mixed with polymer, alter its properties.

Hence the present work was designed to alter the PVC properties through functionalization and addition of nanoclay so that it becomes more efficient for biomedical use. The obtained results can be summarized as below:

- PVC was functionalized with three different functional groups viz. thiosulphate, thiourea, sulphate
- Synthesized LDH/nanoclay by co-precipitation method.
- Functionalized PVC samples were mixed with different percentage of LDH to prepare different functionalized PVC nanocomposites.
- All the samples were subjected to different characterization techniques.
- NMR, FTIR and UV results confirmed the functionalization of PVC with different functional groups
- TGA results showed that degradation temperature of functionalized PVC got lowered leading to lowering of thermal stability. However, addition of LDH to these samples increased the degradation temperature of functionalized polymer nanocomposites, thereby, increasing the thermal stability of the composite.

- Contact Angle measurements depicted increased hydrophilicity of functionalized PVC in comparison to pure PVC indicating increased biocompatibility of modified PVC. Addition of LDH leads to yield more hydrophilicity even better than funtionalized PVC which means more biocompatibility of functionalized PVC nanocomposites.
- SEM images described the surface morphology of different samples.
- Antibacterial assay revealed that modification of PVC decreased bacterial adhesion on the surface of samples.
- The hemolysis assay data revealed 5% lesser hemolysis in modified PVC forms suggesting that modified PVC forms have become more advanced biomaterials than pure PVC.
- Thrombogenecity evaluation showed that clot formation on modified PVC has been less in comparison to pure PVC, which again proves that modified PVC is a better biomaterial.
- All other biological assays also proved increased biocompatibility of funtionalized PVC nanocomposites in comparison to pure PVC.

Hence it can be said that functionalization of PVC with addition of nanoclay increases the biocompatibility of the material, making it more compatible for biomedical use.

6.2 Future scope

The work reported in this present research is development of sustainable functionalized PVC/LDH composites for biomedical applications. However, there are some areas could not covered in this report. Other aspect that may be consider for further investigations are given here.

- Functionalization of PVC with other functional molecule.
- Synthesis of different type of nanoclay with various metal ion combinations.
- Comparison of properties of different functional polymer composites prepared via various LDHs.
- Synthesis of polymer composites using carbon source e.g. carbon nanotubes and grapheme
- To evaluate the more biological study at in vitro and in vivo level