CHAPTER V

CONCLUSION AND SUGGESTIONS

5.1 Conclusion

This study reveals not only that recycled tire-rubber, reclaimed tire rubber (RTR) and ground rubber tire (GRT), can be used as toughening agent of polypropylene (PP), but also that RTR is much better than GRT in enhancing the impact strength of PP. This is because RTR is the devulcanized used-tire rubber, in which the carbon-sulfur bonds that crosslink between the rubber chains have already been ruptured, whereas GRT is still the vulcanized one. Therefore the rubber chains of RTR can penetrate into PP matrix much more than GRT which lead to the better adhesion and higher impact strength. In addition, all PP/RTR blends, either crosslinked by using sulfur crosslinking agents or MA/DCP, show higher impact strength than the non-crosslinked blends, whereas percentage crystallinity and melt flow index are significantly less than one. This research also demonstrates that PP/RTR blends using MA/DCP exhibit even higher impact strength than the one using sulfur crosslinking agent. All these appearances can be concluded that RTR plays an important role in toughening of PP. RTR can disperse well into PP matrix and can be highly crosslinked both among itselves and with PP in case of using MA/DCP. Furthermore, during dynamic vulcanization, the crosslinked rubber phase becomes finer and uniformly distributes in the PP matrix an attains a stable morphology. This attributes to the increase in cohesive strength caused by the crosslinking between PP chains in matrix phase and between the rubber chains in rubber phase when sulfur crosslinking agent were used. In case of MA/CP, the

major increase in interfacial adhesion caused by the crosslinking between two different phases, rubber chains and PP chains, in addition to the crosslinking inside each phase. Eventhough the impact strength of the PP/RTR blend increases with the amount of RTR in the blend, RTR loading is limited by the amount of carbon, already present in RTR, in the blend.

In this research, 70/30 PP/RTR blend using MA/DCP has the highest impact strength, 8.07 kJ/m^2, which is 160% higher than PP, 3.07 kJ/m^2 Its elongation at break is more than 500 %, higher than PP, 350%, as well. Due to its cheaper cost, RTR can thus be very attractive for several applications, particularly, to replace natural rubber and many synthetic rubbers. Besides, reusing RTR is the better way to save the world environment. Accordingly, RTR is the promising material for toughening of thermoplastics.

5.2 Suggestions for Further Work.

1. The blending of PP/RTR using both sulfur crosslinking agent and MA/DCP should be investigated. Its expectation onto impact properties will be increased.

2. The blending of copolymer grades-PP with RTR will be under-investigation due to its composition with rubber-modified may be improved the adhesion between PP/RTR.

3. The blending of other thermoplastic, such as polyethylene (PE), nylon (PA), polystyrene (PS), with RTR should be observed.