RESULTS AND DISCUSSION

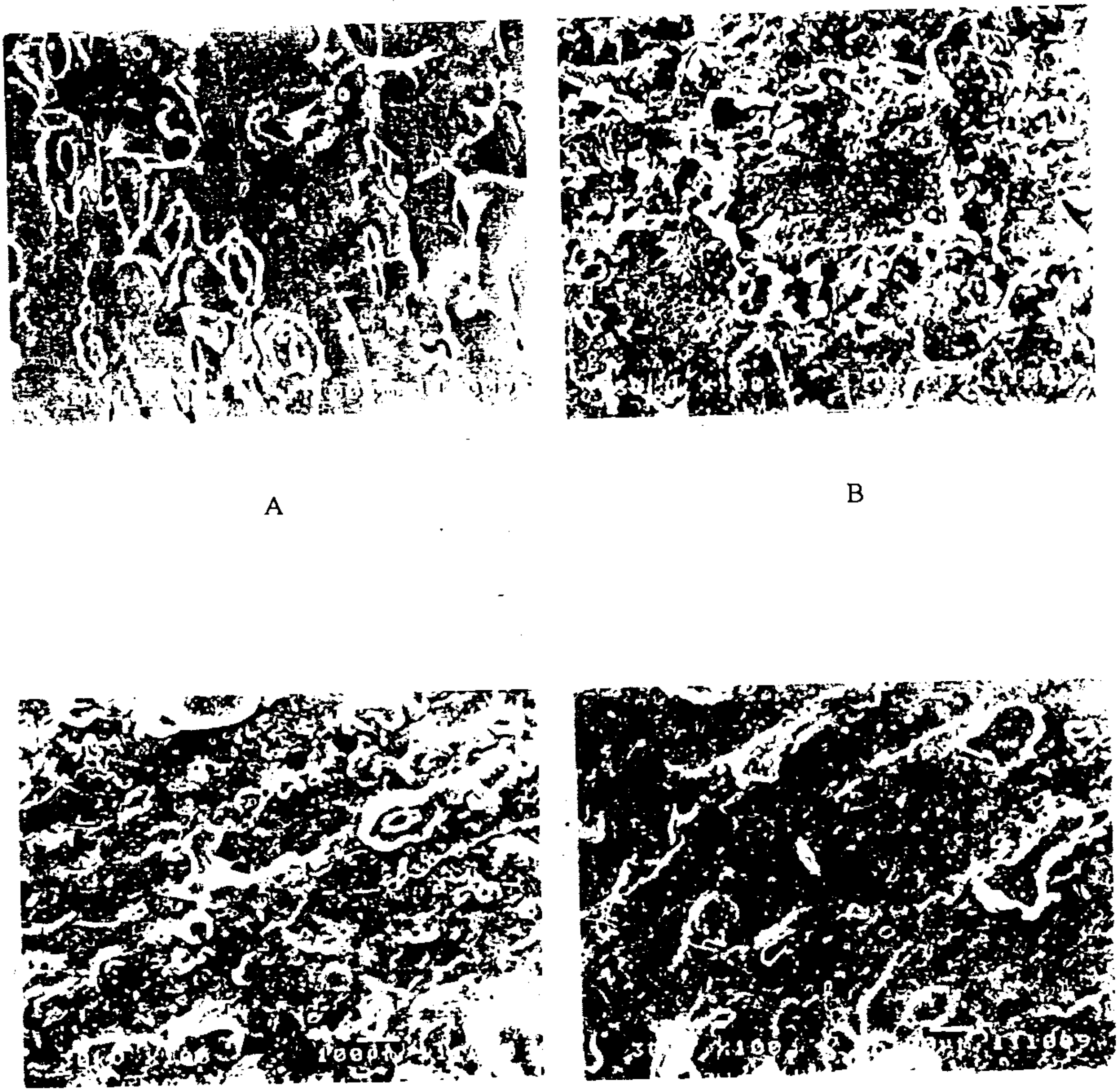
`Chapter 4

Results and discussion

1- Morphology studies

The thermoplastic elastomers are phase-separated system in which one phase is hard , whereas the other phase is rubbery at room temperature. The hard domain acts as pseudo-crosslinks and the properties usually depends on the amount present. The elastomer phase controls the stability and stiffness of the resulting products. Several attempts were done to correlate the morphology with the mechanical properties of the blend(97,98-101) . It was reported(97) that for the same processing conditions, the composition ratios and melt viscosity differences for the components determine the morphology. Generally, the least viscous component was observed to form continuos phase over a large composition range (102).

Figures 13 A-D show the micrographs for NBR/PP blends (20/80, 30/70, 40/60 and 50/50 % wt/wt respectively) from which NBR has been extracted. In figure(13-a), the minor component NBR is dispersed into PP domains phase which represents the continuos phase due to its high percentage and low viscosity. As NBR% increases (30/70) , a relatively large domains size of NBR appears (Fig.13-b). The large domain size of NBR is due to reagglomeration (recombination) of dispersed rubber particles(98,103,104) . In Figure 16c (40/60) both NBR and PP phases exist as co-continuos phase. Increasing rubber percentage higher than 40% (Fig.13-d) significantly affects the morphology of the blend in which PP appears as finally dispersed domains in continuos NBR phase.



A

B

C

D

Figure (13) Scanning electron micrograph for NBR/PP blend, A-20/80, B-30/70, C-40/60 and D- 50/50

Generally, the mode and the state of dispersion of the domains are strongly dependent on the molecular structure and the characteristic of the components, blend composition, blending procedure, and condition of crystallization(105).

2 -Tensile properties

2-i - Effect of blend ratio

Figure (14) shows the effect of increasing PP% on tensile strength of NBR/PP blend. From the figure it is clear that increasing PP% slightly affect TS up to P_{40}-P_{50}, after that, abrupt change to a high TS values was noticed. The tensile strength of the blend depends on PP% , which in turn depends on the crystallinity percentage of PP phase. The presence of NBR decrease the crystallinity of the blend due to the introduction of a soft phase and as a result TS decreases. Martuscelli et al(106) have shown that the spherulite growth of PP phase in the blend with rubber is hindered by the presence of rubber phase. Also, it is noticed that increasing of TS as PP% increases does not follow the additive low i.e. the relation between TS and PP% is not linear . The deviation from linearity is due to the poor interfacial adhesion between PP and NBR phases. Also, the abrupt change in TS may be attributed to phase inversion of NBR from dispersed phase to continuos phase. This behavior is in accordance with data obtained by other investigators(97,107).

Figure(15) shows that the decrease in elongation % at break (E_b) was sharp as the PP% increases up to P_{40}, after that no further decrease in E_b was observed and curve level off .

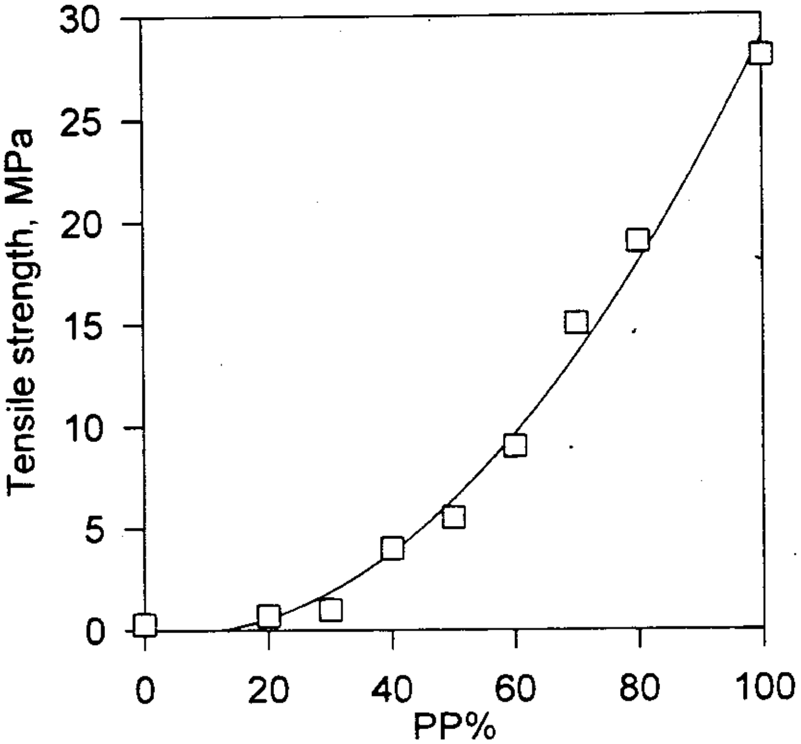


Figure (14) **Effect of increasing PP% on the tensile strength of NBR/PP blend**

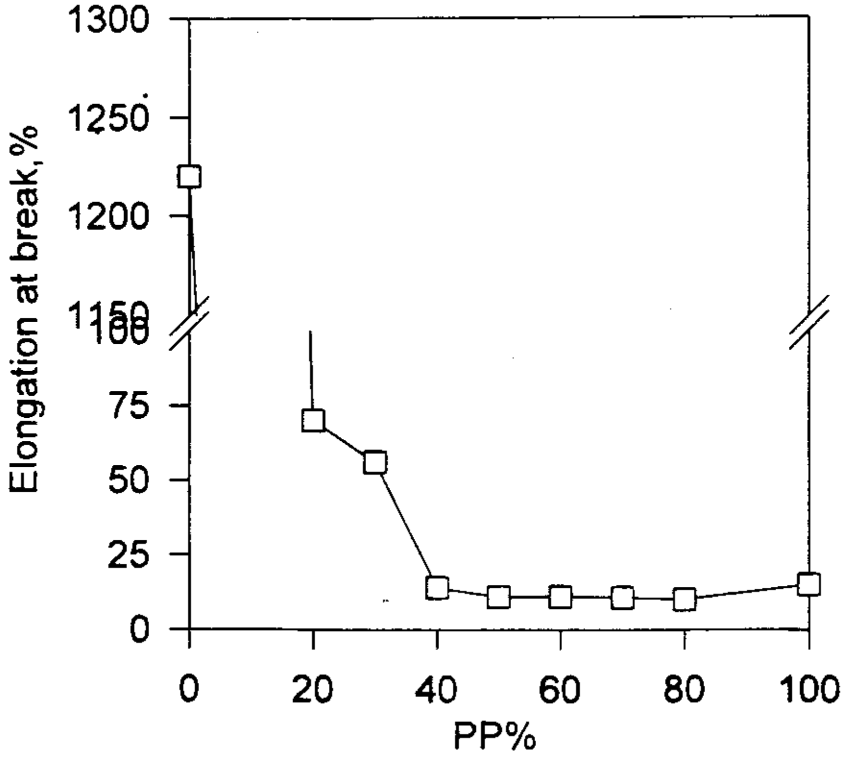


Figure (15) **Influence of increasing PP % on the elongation at break % of NBR/PP blend**