The present work involves the synthesis of a series of NR/PEO or NR-b-PEO block copolymers from a natural raw material, natural rubber (NR), available locally in abundance and polyethylene oxide (PEO). Expecting this polymer material to possess combined properties of the NR and the PEO blocks, the potentiality of this system to function as an elastomer and hydrogel was explored. These honey coloured dry BCs, viz., xerogels were found to swell appreciably in water to cream coloured swollen hydrogels and in the cationic dyes malachite green (MG), crystal violet (CV), safranine T (ST), methylene blue (MB) and bromocresol green (BCG), to the respective coloured swollen hydrogels. Study of the nature of interaction between the hydrogels and the dyes were based on characterization techniques such as spectroscopic technique (solid state UV, IR and NMR), thermal analysis (DSC), XRD analysis and TEM images were used to arrive at the morphological features of the virgin and dye-sorbed block copolymers. The investigation of the swelling characteristics of the NR-PEO block copolymers in water and the dyes MG, CV, ST, MB and BCG offered an insight into the polymer matrix details such as mesh structure, cross-linking density and mechanism of swelling through the transport parameters of swelling in dyes. The equilibrium sorption studies to determine the extent of uptake of the four cationic dyes, viz., MG, CV, ST, MB and BCG, under various conditions of temperature, treatment time, pH, initial dye
concentration and composition of the BCs reveals that the structure and
gometry of the dyes and the PEO content in the BCs influence the adsorption
capacity of the BCs for the dyes. The desorption studies point to the fact that the
dye loaded BCs exhibit, in general, a sustained or controlled release rather than
a burst release.

The results of this study are presented in four chapters. First chapter
gives a general introduction on the hybrid polymer called block copolymers,
their synthesis followed by a review on hydrogels. The chapter concludes with
the scope and objectives of the present investigation.

Chapter 2 describes the materials, methods and the characterization
techniques employed for the present investigation. This chapter consists of three
sections (1) description of the materials used in this study (2) synthetic methods
for the preparation of block copolymers, viz., NR-b-PEOs and (3) description of
the analytical techniques employed for the characterization of the virgin and
dye-sorbed block copolymeric hydrogel, swelling, sorption and desorption
studies.

Chapter 3 encompasses the results and discussion under five
subsections. Section 1 deals with the synthesis of the block copolymers. Section
2 is a description of the characterisation of the virgin and dye-sorbed block
copolymeric hydrogel. Section 3 covers the swelling studies of NR-b-PEO
hydrogels in water and aqueous dye solutions of MG, CV, MB, ST and BCG.
The extent of sorption of these hydrogels in water and basic dyes is dealt with, in Section 4. Section 5 is devoted to preliminary desorption studies of the dye-sorbed hydrogels.

The summary and conclusion of the present work is presented in the fourth chapter. References are given at the end of the first three chapters. A list of publication is presented in the appendix.