

Name: Rabia Kouser

Supervisor: Prof. Sharif Ahmad

Department: Chemistry

Title: Development of Biodegradable Polymer Based Nanocomposite Hydrogels

Keywords: Nanocomposite Hydrogels, Drug delivery systems, Biopolymers, Cisplatin, Nanofillers.

ABSTRACT

Nanocomposite hydrogel (NCHs) based drug delivery systems are attractive due to their characteristic properties like water absorption capacity, biodegradability, biocompatibility and high mechanical strength. NCHs are being explored as film material, in wound dressing application, tissue engineering, contact lenses, biosensors etc. Among the various forms of NCHs based drug delivery systems injectable and orally administered forms are gaining interest. Generally, the use of chemotherapeutic drugs shows limited, because of its non-specific bio-distribution and severe side-effects. Therefore it becomes imperative to develop drug delivery systems for the sustained release of these drugs. The objective of present thesis is to develop different NCHs (films and gels) using chitosan, CMC, HEC and PVA (as a matrix), linseed oil based polyol (as a cross linker) and CNT, NaMMT, fumed silica (as a Nano fillers) via solution blending and free radical polymerisation technique and to use the prepared NCHs as a potential candidate for their application in delivery of anticancer drug (cisplatin). The polyol derived linseed oil and various Nano fillers (MWCNT, NaMMT, fumed silica) was used to prepare highly cross linked networks nanocomposite hydrogels for enhancing and distinguishing their useful properties. Nanofillers seems to dominantly affect the characteristic features like mechanical

strength, swelling, biodegradable, biocompatible and drug release behavior of nanocomposite hydrogels. The biocompatibility, cytotoxicity and drug delivery system of the resultant hydrogels were evaluated using MTT assays of normal HEK-293, cell lines. The *in-vitro* anti-proliferative efficiency of drug loaded hydrogels for were also tested using human breast MCF-7 and colon HCT116 cancer cell lines. These studies shows that the nanocomposite hydrogels holds potential as a sustained delivery of chemotherapeutic drugs. The in vitro drug loading and release studies of anticancer drug cisplatin from the nanocomposite hydrogels have been investigated.