

## ABSTRACT

Hydrogel have attracted attention recently due to their unique properties including water absorption ability, flexibility, versatility, stimuli-responsiveness, soft structure and suitable to native tissue. Hydrogels are used in many fields like biomedical application due to their biocompatibility, low immunogenicity, and biodegradability. Here, this thesis work is mainly focused on the modification of standard collagen hydrogels that use for the corneal implants.

Type I collagen was chosen due to their existence in cornea and can easily form three-dimensional structure of hydrogels. Interesting results were found on how the determined parameters affected the stabilized collagen hydrogel. In this approach, the modification of collagen hydrogel was conducted by using one of proteoglycan namely decorin, because decorin is small leucine-rich proteoglycan that is naturally exist at high levels bind to collagen in the corneal stroma. Decorin plays crucial role in regulation collagen fibril and extracellular matrix to sustain corneal transparency. The other modification of collagen hydrogel was the addition of riboflavin and UV radiation. The riboflavin and UV radiation was also used to enhancement of mechanical properties of hydrogel. The transparency was measured in UV-Vis-Spectrometer at 210 nm using two different formulations, one employing decorin and the other one employing decorin with RFUV. Experimental evidence was indicated that decorin and RFUV cross-linking are involved in the regulation of collagen fibrillogenesis. Furthermore, the enzyme collagenase was tested to examine the susceptibility of collagen hydrogel for corneal implant purpose.

**Key words:** Hydrogel, Collagen, Decorin, Riboflavin, UV light, UV/Vis Spectrophotometry, Collagenase