Summary

The textile industry releases large amounts of effluent from its dyeing activities. Textile dyeing operations can use different classes of dyes and auxiliary chemicals depending on the textile, which results in a wastewater comprised of mixed residual dyes and auxiliary chemicals. The resistance of dyes to degradation makes their removal from textile wastewaters difficult Therefore, the dye removal from textile wastewater is a great challenge, and a significant amount of research has been devoted to dye removal from textile effluents. Adsorption is one of the popular technique due to its inherent advantages of low cost and simplicity. Among the new generation technologies heterogeneous catalytic and photocatalytic treatment appears to be an attractive option to degrade or even mineralize organic pollutants. The efforts in this direction are described in the thesis.

The **first chapter** thus gives an introductory overview of the importance of removal of dyes, the commonly used techniques for the removal of dyes described in literature, with thrust on adsorption and advanced oxidation processesand hence, the objectives for the present work.

The **second chapter** describes the green synthesis of Ag nanoparticles and their stabilization using palm shell extract (AgPS) and Guargum (GAgPS) for stabilization and reduction. Attempts in dispersion of AgPS in chitosan as well as chitosan Guargum blend are also described. The characterization of these nanoparticles/nanocomposites and their application as SERS substrates for dyes (Rhodamine 6G(Rh-6G), Reactive Blue 21(RB-21) and Reactive Red 141(RR-141)), catalysts for degradation of dyes using H_2O_2(single as well as binary components), catalysts for reduction of nitrophenol are also included.

The **third chapter** comprises the synthesis of iron oxide nanoparticles capped with palm shell extract (IO) as well as the composite of IO with chitosan (CIO). The chapter further describes the characterization of IO and CIO as well as their application as Fenton's reagent for degradation of single as well as binary mixture of dyes Rh-6G, RB-21 and RR-141 using H_2O_2.

The synthesis of chitosan-clay, chitosan-hydrotalcite as well as N-Vinyl pyrrolidine grafted chitosan-clay composites /nanocomposites, characterization as well as their application

as adsorbents for single and binary mixtures of the dyes Rh-6G, RB-21 and RR-141 is described in **chapter 4**.

Chapter 5 includes the synthesis of layered zirconium phosphate (ZrP) and its composite with chitosan (CZrP), their application as catalysts for degradation of dyes Rh-6G, RB-21 and RR-141 using H_2O_2 (single as well as binary components) and also their application as adsorbents for single and binary mixtures of the dyes.

The synthesis of Zirconium tungstate, characterization as well as its application as catalyst for degradation of dyes using H_2O_2 (single as well as binary components of Rh6G, RB21 and RR141) is included in **chapter 6**.

The overall conclusions of the work done and the areas where further work is required are summarized in **chapter 7**.