CHAPTER I

INTRODUCTION

Nowadays large amounts of chemically different dyes are used for various industrial applications including textile industry. The process produces large quantities of highly colored effluents, which are generally toxic and resistant to destruction by physical, biological and chemical treatment methods. Textile wastewater, being mostly non-biodegradable under both natural and sewage treatment plant conditions, is a potential nuisance to the environment. Therefore, it is necessary to find an effective method of wastewater treatment capable of removing colour and toxic organic compounds from textile effluents. These non-biodegradable compounds can not be completely removed by biological treatment and wastewater contaminated with these substances must be treated by physical and chemical means, including photolysis, advanced oxidation processes (AOPs)

Azo dyes, aromatic moieties linked together by azo (-N=N-) chromophores, represent the largest class of dyes used in textile-processing industries. The release of these compounds into the environment is undesirable, not only because of their colour, but also because many azo dyes and their breakdown products are toxic and/or mutagenic to life.

Over the last several years, a great of interest has been focused on the degradation of dyes and organic compound in wastewater from textile industry. The famous method is photocatalytic oxidation process (UV/H_2O_2, UV/TiO_2; UV/Fenton's reagent; UV/O_3 and other) which are all based on the formation of free radicals due to UV irradiation. This method belongs to advanced oxidation processes (AOPs) which can be defined as oxidation by compounds with an oxidation potential (E_0) higher than that of oxygen (1.23 V), i.e. hydrogen peroxide (E_0 = 1.78 V), ozone (E_0 = 2.07 V) and the hydroxyl radical (E_0 = 2.28 V). Faster, cheaper and more effective photocatalytic processes receive therefore increasing attention, especially those based on catalysis by solid semiconductor materials, mostly TiO_2 particles. With TiO_2 catalyzed UV treatment, a wide range of dyes can be oxidized. The dyes are generally not only decolorized but also highly mineralized.

However, TiO_2 exhibits low adsorption ability, especially for non-polar substances due to its polar structure. Due to the problem TiO_2 particle can be improved by surface augmentation using inert supports such as zeolite.

Because of very large specific surface area, MCM-41 is of great interest to be used as support material for heterogeneous catalyst. However, the efficiency of pure silica MCM-41 limits catalytic applications, thus, incorporation of transition-metal ions into the silica framework could improve the catalytic performance of MCM-41.