Chapter - I
INTRODUCTION
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The chemistry of macromolecules is at the present time one of the most vigorously developing branches of chemistry. The rapid rate of its development can be accounted for the fact that the synthetic chemistry of polymers ensures the growth of important branches of polymer science. It may be assumed that synthetic chemistry of polymers was initiated in 1833 when Berzelius[1] formulated the concept of polymerization which was persisted with some modification to present day. Although naturally occurring biological polymers such as proteins were very much in use over hundred years yet the chemical aspects of polymer science were established on firm scientific footing due to pioneering work of polymer scientists like Staundinger[2-8], Carother[9], Kuhn[10-12]. Thus during the 159 years, since, the field of macromolecules has been enriched by a large number of new synthetic method and polymers of different structures. As a result of this a number of synthetic polymers have been enormously developed during the past few decades. These polymers, because of unique characteristics such as ease of fabrication, low density, economic values, chemical inertness and high electrical resistivity, have replaced traditional materials in the daily life of human beings.

There are two reasons for the rapid growth of polymer science, first, is the invention of new polymerization technique
like plasma polymerization [13], group transfer polymerization [14], template polymerization [15], gas phase polymerization [16], microemulsion polymerization [17], metathesis polymerization [18] & metal containing polymerization [19] for the polymerization of conventional vinyl as well as non-vinyl monomers. The second reason is the synthesis of new monomers and their polymerization by using different compounds as new novel initiators, inferters and chain transfer agents.

Synthesis and polymerization of metal containing monomers is a relatively new discipline of polymer science. It was not until the 1965 [20] that the research papers appeared for the first time in various polymer journals. The expected development of the subject was greatly enhanced because of their unique properties due to the metal present in the polymer backbone. As a result, number of publications including review papers have enriched the literature [21-24]. In these publications, advances have not been made in the field of metal containing polymers and obtaining new experimental evidences, advances which forms the subject of present monograph, for example almost no efforts have not been made for homo, template and copolymerization of chromium acrylate with different monomers like styrene, acrylonitrile and furan. Therefore, a potential need exist to understand the precise kinetics and mechanism of polymerization of chromium acrylate using novel initiators like styrene-arsenic sulfide complex,
phenacyl dimethyl sulfonium ylide mercuric chloride complex which have been recently reported [25-29] for polymerization of few vinyl monomers like styrene, methylmethacrylate, methyl acrylate, 4-vinyl pyridine.

In the present monograph, the kinetics and mechanism of homo, template polymerization of chromium acrylate and its copolymerization with styrene, acrylonitrile, furan using styrene-arsenic sulfide complex and phenacyl dimethyl sulfonium ylide mercuric chloride complex is discussed.