



4<sup>TH</sup> National Conference of Iran Chemistry, Chemical Engineering And Nano

## **A NOVEL HYBRID ORGANIC-INORGANIC HYDROGEL NANOCOMPOSITE BASED ON SODIUM ALGINATE**

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**Abstract:** In this project, we reported synthesis and structure characterization of a novel organic-inorganic hydrogel nanocomposite based on sodium alginate-silicone dioxide. The hydrogel nanocomposite was prepared using grafting of acrylic acid (AA) onto sodium alginate by using ammonium persulfate (APS) as a free radical initiator and methylene bisacrylamide (MBA) as a crosslinker in the presence of silicone dioxide nanoparticles. The structure of hydrogel nanocomposite was then characterized by FTIR, SEM, EDS, and UV-Vis techniques and a proposed mechanism for preparation of nanocomposites was also suggested.

**Keywords:** Hydrogel; Nanocomposite; Sodium alginate; Silicone dioxide; Acrylic acid.

### **1. INTRODUCTION**

Hybrid inorganic-organic nanocomposites, composed of inorganic nanoparticles and functional polymers, are a novel and unique class of materials. In recent years, they have become more important because of their improved properties, which are derived from synergistically combined properties of inorganic particles and organic polymers. Many polymeric and inorganic based materials and physico-chemical methods have been developed for the removal of heavy metals from industrial effluent [1-4]. The most common procedure for the synthesis of hybrid materials is based on sol-gel process, for the formation of inorganic network onto the surface of polymer matrix [5]. Recent years, attention has been devoted to synthesis of monodispersed silica nanoparticles because of their uniform size, shape, composition and functional properties as well as their effectiveness as surface modified substrate [6].

The main focus of this manuscript is the development of a high performance nanocomposite based on silica nanoparticles incorporated poly(acrylic acid) grafted onto sodium alginate. The prepared polymeric nanocomposites were then characterized by FTIR, SEM, EDS, and UV-Vis methods.

### **2. EXPERIMENTAL OBSERVATIONS**

In general, an appropriate amount of sodium alginate was dispersed to 50 mL of doubly distilled water in a two-neck reactor equipped with a mechanical stirrer (500 rpm) which was immersed in a thermostated water bath preset at 70°C. After 30 min, the monomer AA solution and the initiator APS solution (0.10 g dissolved in 5 mL H<sub>2</sub>O) were added and stirred for 20 min. After dispersing and homogenizing the mixture, appropriate amount of MBA (0.10 g dissolved in 5 mL H<sub>2</sub>O) was added into the solution. Finally, the product was poured into 100 mL of ethanol and remained for 3 h for dewatering. The synthesized product washed with ultra pure deionized water three times and dried at 70°C for 10 h in vacuum oven (Figure 1).