INTRODUCTION

Nowadays, Energy sources are very important in our daily life because almost everything around us need energy for their livings. These are the causes of many pollution such as air pollution, water and soil pollution. Air pollution such as carbon monoxide (CO), benzene, and much harmful gas are released into the environment by motor vehicles and industries which use petroleum fuels, the limited resources, as energy sources. In order to decrease the use of non-renewable and the environmentally harmful petroleum, the fuel cells are considered as environmental friendly sources for the vehicles instead of the petroleum. They are the electrochemical ener gy conversion devices that produce electricity from external quantities of fuel and an oxidant. These react in the presence of an electrolyte. Generally, the reactants flow in and reaction products flow out while the electrolyte remained in the cell. Fuel cells can operate virtually continuously as long as the necessary flows are maintained.

In essence, a fuel cell works by catalysis, separating the component electrons and protons of the reactant fuel, and forcing the electrons to travel through a circuit, hence converting them to electrical power. The catalyst is typically comprised of a platinum group metal or alloy. Another catalytic process takes the electrons back in, combining them with the protons and the oxidant to form waste products. Many gas-phase catalytic processes exhibit pronounced particle size dependence in the catalytic activity, and evidence for a particle size effect in electrochemical reactions, such as the methanol oxidation, oxygen reduction (A. Kabbabi *et al.*,1994) have been documented.

Regardless of the choice of fuel either industrial hydrogen or methanol, platinum catalyst is used with other elements, e.g. ruthenium, to increase anode tolerance for surface poisoning. Despite these efforts, carbon monoxide, present as an impurity poison and its removal from the catalyst surface are not very well known. They are still being investigated intensively (Waszczuk *et al.*, 2001) in the hydrogen, or as a side product of methanol decomposition, causing surface poisoning and poor performance of the catalyst. Despite their tremendous importance in fuel cell technology, chemical reactions involved in the formation of CO poison. A considerable reduction of CO poisoning has been made with the addition of other catalysts, such as Ru, Sn, W, Mo, or Os along with Pt to inhibit CO adsorption (Huang *et al.*, 2008).

Consequently many earlier studies were devoted to the preparation of nanoparticles with controlled size and shape. There have been many methods investigated and reported of how to prepare Pt and Ru nanoparticles either in colloidal form or incorporating with high surface area substrates. However, the most widely used method is chemical reduction which requires a reducing agent and a stabilizer simultaneously. Some effective reducing agents have been found to be able to reduce platinum and Ruthenium salt to Pt(0) and Ru(0); for instance, citrate salts, $NaBH_4$, polyols, alcohols and alkoxides. A stabilizer is added in order to prevent metal particles from aggregation. Linear polymers are often used as a stabilizer during preparation of Pt and Ru nanoparticles.

The wide range of basic polymers, including poly(vinyl alcohol) have been examined for application as supports for metal nanoparticles. PVA is a well known polymer with many characteristic, such as; high hydrophilic properties, high tensile strength and flexibility, non-toxic, biocompatible and odorless, hence, PVA has been investigated in many researches. Interestingly, it has been reported that the metal nanoparticles have been incorporated into polymer nanofibers by electrospinning method. Especially, PVA has been electrospun directly with Au (Bai *et al.,* 2007) and Ag (Jin *et al.,* 2007).

Electrospinning is one technique that produces polymer fibers with nanometer-sized diameters from polymer melt or polymer solution with the use of electrostatic forces. The standard set up for electrospinning consists of a spinneret with a metallic needle, a syringe pump, a high-voltage power supply, a grounded collector, polymer, sol-gel, and composite solution (or melt). In this spinning process, a high voltage is applied to a polymer solution to induce electric charges on the surface of polymer. Above a critical voltage, electrostatic forces overcome the surface tension of the solution, and an electrified polymer jet is formed. The solidified fibers are formed by the evaporation of solvent in polymer solution and the cooling down of the fibers in case of polymer melt. The fiber's arrangements are random with nanometer-scale diameters. In this present work, the various amounts of platinum salt and ruthenium salt were reduced directly by citrate ions in PVA aqueous solution. Then the prepared solutions were introduced into the electrospinning technique to form the composite nanofibers.