ABSTRACT

The use of solar energy as a renewable source is one of the most promising resources to generate electricity. The viability of concentrating solar power (CSP) systems depends on the development of highly reflective materials that are inexpensive and maintain their optical properties for extended lifetimes under outdoor environments. In this chapter, the implementation of flexible polymer substrates plated with silver by the Dynamic Chemical Plating technique (DCP) is proposed because of its low cost, and easy and rapid deposition, in addition to the high speed at which the deposit is made. However, the deposits made under this technique have certain nanoscale imperfections, which begin to exist certain permeability of substances that can stain the silver over time, so a study of this feature is performed, to help assess their durability.

INTRODUCTION

The Sun is the source of life and origin of almost all other forms of energy that man has used since the beginning of history. It would be irrational not to try to take advantage by all possible techniques, this free, clean and inexhaustible energy source, which can liberate us from dependence on oil or other unsafe, polluting or simply exhaustible alternatives.

It is vital to continue with the development and improvement of technology to collect, accumulate and distribute solar energy, for the very conditions that make it definitely competitive on a global scale.

DOI: 10.4018/978-1-5225-1671-2.ch063
Solar radiation can be converted to electricity in two ways: either through solar panels that generate electricity directly, or converting solar radiation into heat energy and then convert it into electricity. Regarding the second, is having a great commercial prosperity in a number of countries with high insolation levels. These energy recovery systems are called Concentrating Solar Power (CSP).

CSP systems use mirrors or lenses (solar concentrators) with tracking systems to focus a large area of sunlight onto a small area. The concentrated light is then used as heat or as a heat source for a conventional power plant (solar thermoelectricity). Solar concentrators represent about 60% of the cost of a CSP, which represent an important motivation to study them and decrease their cost (Wang, 2010).

Structure concentrators consist of a support structure, a substrate, a reflective agent (steel, aluminum or silver) and a transparent protective layer which enables preservation of the properties of the substrate. Its features should be: low production cost, long life in environment condition, high transmittance, among other (Barlev, Vidu, & Stroeve, 2011).

In this chapter, different configurations are considered, using aluminum as the substrate, or, the silver plating on polymer by Dynamic Chemical Plating technique (DCP) with a protective coating. Further, several coatings were prepared by sol-gel technique and their optical properties were studied as well as feasibility for use in solar technology.

**BACKGROUND**

**Historic**

212 BC, Archimedes used mirrors for the first time to concentrate the Sun’s rays. In 1615, a small solar powered motor was developed by Salomon De Caux, this motor consisted of glass lenses and an air-tight metal vessel. Lavoisier and Joseph Priestley developed the theory of combustion by concentrating solar radiation on a test tube for gas collection. In 1878, Paris, a small solar power plant was exhibited; the plant was made of parabolic dish concentrators. The first CSP was installed in 1913, in Egypt as a parabolic trough solar field for pumping water. Because of the oil crisis in 1970s lot of pilot CSP plants were built. Then, the first commercial CSP was operated in California, USA (1984-1991) It was not until 2006 that interest was once again rekindled for the development of large scale CSP plants. (Behar, Khellaif, & Mohammed, 2013).

The central solar thermal electricity produced concentration similarly to conventional power plants: using steam to drive a turbine. The difference between them lies in the origin of energy instead of fossil fuel using solar radiation. Solar concentrators with tracking systems focus a large area of sunlight onto a small area. Thus, four main elements are required: Solar concentrator, receiver, some form of transportation or storage, and power conversion.

Techniques use solar radiation to electrical energy conversion using an intermediate conversion into thermal energy are classified into two groups: those that concentrate solar radiation along a line and concentrate solar radiation at a point. For linear concentration, two technologies that are used: parabolic trough and linear Fresnel reflector. Pointed concentration, with much higher concentration ratios and the ability to track two axes, there are two applicable technologies: the central tower and parabolic dish using Stirling engines (Fend et al., 2003).