

Abstract

In this research an experimental study has done for testing the thermal performance of selective surfaces used in solar collectors for substrate of iron, galvanized iron and aluminum which are commercially available. The coating process for the samples has done in two ways, the electroplating and the chemical spray pyrolysis. The results of the thermal performance test of these samples are comparing with the thermal performance of a sample without paint and other paint with black paint without shines commercially available.

For the electroplated samples, the performance study has done for different immersion time in plating bath, the distance between electrical poles, the current density, and area ratio of the sample plated area to the nickel pole face area. The chemical sprayed pyrolysis samples, study has done for different coating times, atomizing gas pressures, distance between the aperture of atomizer and the sample and the paint mass flow rate.

The results showed that the best performance of the iron's samples is the sample which is coated with two layers. The first layer is of zinc done by electroplating where the time of plating is (2 min.) and the second layer is of black nickel done by electroplating, where the time is (20 min.), the distance between the poles is (6 cm), the current density is (0.15 A/dm^2) and area ratio of the sample plated area to the nickel pole face area is equal to (1). The percentage of the increasing in heat storage of electroplating sample to galvanized iron sample without paint at the beginning of testing the performance of samples and at the end were (58.23% & 44.97%) respectively.

For aluminum samples, the best performance was regarded for two samples electroplating sample and chemical spray pyrolysis sample. The best electroplating sample was coated with a layer of black nickel where the time of plating is (20 min.), the distance between the poles is (6 cm), the current

density is (0.15 A/dm^2) and area ratio of the sample plated area to the nickel pole face area is equal to (1). While the best chemical spray pyrolysis sample has been coated with a layer of black nickel where the time of plating is (16 sec.) and the distance between the aperture of the reservoir and the surface of the sample is (27 cm), the amount of flow is (4.8 ml / min.), the atomizing gas pressure is (1 bar) and temperature of the sample surface is (290° C).