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Selective Solar Coatings Applied by Electrodeposition and Sputtering in Concentrating Solar Systems for the Conversion of Solar Energy to Thermal Energy

The development of selective solar coatings (deposited with different techniques) used in solar to thermal heat conversion systems, for domestic and industrial applications, provide a promising alternative to the consumption of fossil fuels and could help the global effort of lowering CO_2 emissions. Some of the most important examples of this technologies are the solar collectors that are already used to produce heat in chemical, mining, food and textile industries. Industrial solar collectors have proved to be very profitable investments, since they are amortized between 3 and 5 years, and the equipment lasts up to 25 years.

This work presents the different types of selective solar coatings that have been developed at CINVESTAV-Mérida with electrochemical deposition techniques using materials as black nickel, black cobalt, cobalt-manganese oxide and bright nickel; and those developed using RF and DC sputtering deposition technique with materials like molybdenum and alumina. The solar selective coatings developed and characterized in this work, have shown optimal spectral performance with reflectance values in the range of 85-95% that compete with the best commercial selective coatings like TiNOx Energy which has a reported spectral selectivity of 96%.

The results obtained in the measurement of low to medium temperature solar thermal energy conversion systems such as flat fin collectors and parabolic

trough concentrator; showed that the thermal performance of collectors with selective coatings developed are promising for application in domestic and industrial collectors. The selective coatings developed in this work help to generate energy sustainability when applied in systems with technology based on renewable energy sources.

Keywords: Selective Solar Coating, Electrodeposit, Sputtering, Thermal Efficiency.