Pergamon

Int. Comm. Heat Mass Transfer, Vol. 24, No. 6, pp. 747–756, 1997

0735-1933/97 $17.00 + .00

PII S0735-1933(97)00062-6

MICROSCOPIC OBSERVATION OF CALCIUM CARBONATE PARTICLES: VALIDATION OF AN ELECTRONIC ANTI-FOULING TECHNOLOGY

Chunfu Fan and Young I. Cho
Department of Mechanical Engineering and Mechanics
Drexel University
Philadelphia, PA 19104

(Communicated by J.P. Hartnett and W.J. Minkowycz)

ABSTRACT

It is hypothesized that an electronic anti-fouling (EAF) technology precipitates dissolved mineral ions through solenoid-induced molecular agitation. In order to investigate the hypothesis of the EAF technology, the present study conducted microscopic observation of calcium carbonate crystallization process from both untreated and treated water samples by the EAF technology as the water samples underwent drying process. The untreated water sample showed a large number of small crystals within a range from 1 μm to 10 μm in diameter, whereas the treated water sample by EAF technology showed large crystals ranging from 10 μm to 20 μm in diameter. © 1997 Elsevier Science Ltd

Introduction

Hard water is the culprit of the precipitation fouling problem. Hard water can be described as water containing excessive amounts of dissolved ions beyond the saturation limit of each ion, hence becoming very "unstable." When the supersaturated water enters heat transfer equipment, the solubility of dissolved mineral ions changes. Subsequently, the mineral ions come out of the water, precipitating and adhering to the heat transfer surface. The solubility changes primarily due to the changes in temperature, pressure, and pH of the water. The solubility decreases with increasing temperature for calcium carbonate, one of the most common scales.

Once scales build up in a heat transfer surface, at least two problems associated with scales occur. The first problem is the degradation in the performance of the heat transfer equipment due