CHAPTER

NANOMATERIALS FOR HUMIDITY AND TEMPERATURE SENSING APPLICATIONS

18

Ruziana Mohamed[1,2], Ahmad Syakirin Ismail[3], Azianty Saroni[4] and Mohd Firdaus Malek[1,2]

[1]Faculty of Applied Sciences, Universiti Teknologi MARA (UiTM), Shah Alam, Selangor, Malaysia [2]NANO-SciTech Lab (NST), Centre for Functional Materials and Nanotechnology (FMN), Institute of Sciences (IOS), Universiti Teknologi MARA (UiTM), Shah Alam, Selangor, Malaysia [3]Faculty of Manufacturing and Mechatronic Engineering Technology, Universiti Malaysia Pahang Al-Sultan Abdullah, Pekan, Pahang, Malaysia [4]Faculty of Applied Sciences, Universiti Teknologi MARA Pahang, Bandar Tun Razak Jengka, Malaysia

18.1 INTRODUCTION

Humidity and temperature sensor have received attention, which can be used in indoor or outdoor applications. Humidity measurement is important for the balance of the environment. It has received awareness due to these vapors are reactive dipolar molecules that can condense and evaporate even with slight changes in ambient temperature. Almost all environmental phenomena are controlled by humidity caused by electron-negativity differences of hydrogen and oxygen atoms [1]. Humidity control has been used in our daily life like the use of air conditioning in the living room and in the field of agriculture to store the seed, meteorology to monitor the environment industrial in chemical storage, electronic processing [2,3]. Temperature sensors define as a device that can detect and react to the changes of heat in the surroundings [4]. The fundamental concept comes out from the second law of thermodynamics in terms of the rate of change of energy with entropy. Generally, conventional contact thermometer (such as thermocouple) needs a direct heat transfer and thermal equilibrium between the measured object and the sensor [5]. These properties might cause a long time and change the actual temperature of sample during measurement, especially the size of the sample is small as compared to the sensor head.

Sensing materials are an important part that plays a vital role in detecting small changes that occur in humidity or temperature. Metal oxide [6,7], carbon-based materials [8,9] and polymers [1,10] are among the most widely used sensing materials as moisture sensors. As for temperature sensing, most of the materials used are carbon [11,12], fluorescent [13,14] and ceramic [15,16]. Each of these materials has its own characteristics according to the specific needs of the application.

In humidity detection, the sensing element reacts to different atmospheric humidity conditions, which it adsorbs or desorbs the water molecules. These small changes will be interpreted in physical properties especially in electrical properties. The units that are frequent in humidity measurement are relative humidity (RH), dew/frost point (D/F PT), and parts per million (PPM) [1].

Nanomaterials in Environmental Analysis. DOI: https://doi.org/10.1016/B978-0-12-820643-0.00021-3
Copyright © 2024 Elsevier Inc. All rights are reserved, including those for text and data mining, AI training, and similar technologies.