Thermal energy storage dodoma

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Thedrying experiments were conducted under two operating modes:a solar dryer with load but without TES and a solar dryer with loadand TES materials. Data were collected on three consecutive days ineach mode, and the average values were determined. Data collectionwas performed from January to March 2023.

Inmost cases, measuring instruments are subjected to errors, regardlessof their precision and accuracy. The two major causes of these uncertaintiesare measuring devices, sometimes known as systematic errors, and measurementskills or random errors. Uncertainty assessment is crucial for designingand implementing the experiment.26 Thetotal errors were calculated by using eq 1 according to Gulcimen, Karakaya, and Durmus.27Table 2 shows the instruments used for the measurements and theiruncertainty assessments

The overall uncertainties in the measuringdevices and readingerrors were calculated according to eq 3 and found to be ?0.0701%. This value is smallcompared to the acceptable range of ?10%, according to Choi,Kikumoto, Choudhary, and Ooka.29

The performanceof the solar dryer integrated with soapstone as a TES material wasanalyzed by determining the sensible heat energy storage of TES materials(E), storage efficiency of TES materials (is) weight of water evaporated from the product (Mw), drying rate (Dr), thermalefficiency (it) collector efficiency (ic), and saving of drying time (%). In addition, a comparativeevaluation of drying time, temperature, and relative humidity by usingTES materials, without TES materials, and OSD were conducted.

The amount of energy storage by materials is an essential parameterin selecting TES materials because it describes the amount of heatenergy that can be stored in the materials at a particular time. Theamount of energy storage was estimated by eq 4 according to Cetina-Qui?ones, L?pez,Ricalde-Cab, El Mekaoui, San-Pedro, and Bassam18

where E = energy storage(J), Ma = weight of storage materials(kg), Cp = specific heat capacity of soapstone(J/kg ?C), Ti = temperature of thestorage materials at time t (?C), and Tf = temperature of the storage material in the proceeding time(?C).

The storageefficiency of TES materials (is) is the ratio ofthe discharged energy to the charging energy from the TES materials;it was calculated by using eq 5 according to Cetina-Qui?ones, L?pez, Ricalde-Cab,El Mekaoui, San-Pedro, and Bassam18

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