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Three-dimensional conjugate numerical model of heat and mass transfer of porous food material during convective drying process PUNIT SINGH, DALBIR SINGH, PRABAL TALUKDAR, Indian Inst of Tech-New Delhi — Convective drying is the most popular and widely used drying method of food preservation especially seasonal foods. Dried food materials can be stored for longer time and therefore is helpful to feed the world population as well as to save the world capital. A 3-D conjugate numerical model is developed in COMSOL Multiphysics commercial software by assuming food as a hygroscopic, multi-phase, multicomponent porous material having interconnected pores of different sizes. The model is developed to determine the heat and moisture distribution in the porous food material by considering surface and internal evaporation, and variable thermophysical properties of food material. The cylindrical shaped Elephant Foot Yam (EFY) is considered as a food sample in this work. It is found that in the starting of drying process, the average temperature of the EFY sample rises quickly due to sensible heating, after that it becomes constant for a while due to moisture evaporation and again it rises steadily till the equilibrium is reached. The entire drying curve is characterized by three falling rate periods along with initial drying rate and very small constant rate period. These two periods are much smaller than the three falling rate periods.

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