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Cornell University Food Scientist Receives Young Food Engineer Award

By Joe Ogrodnick

GENEVA, NY: Cornell University food scientist John S. Roberts, who works at the New York Agricultural Experiment Station in Geneva, NY, received the International Young Food Engineer Award at the Ninth International Conference on Engineering and Food (ICEF) in Montpellier, France, in March. The honor is accorded to a food engineer who is less than 40 years old who has submitted the best paper.

"This award is given once every three years, so I was very honored to have received it," said Roberts, whose paper was titled "Understanding the heat and mass transfer of hygroscopic porous materials."

Roberts' approach to investigating mass transfer during a simultaneous heat and mass transfer process, such as drying, is novel in that transient heat transfer is eliminated. Using controlled microwave energy and convective hot air, uniform temperatures are established and maintained at any drying temperature. Therefore, accurate measurements of how moisture migrates through biological materials, which greatly depend on temperature, are obtained when the material is at a single uniform temperature.

"From these accurate measurements, we have been able to impressively predict moisture transfer in biological solid materials, such as potato," Roberts said. "For biological porous materials, such as bread and apple, drying is governed by evaporation of the moisture in the material to the pore spaces."

Roberts explained that a prediction model based on this evaporation was shown to significantly predict moisture loss in biological porous materials during uniform temperature drying.

"During normal drying conditions in which only convective hot air is used, porous materials experience extreme temperature gradients where the surface of the material, which is in direct contact of the hot dry air, is the warmest region and gradually approaches the hot air temperature while the center region experiences constant temperature significantly below the hot air and surface temperatures," said Roberts. "When this happens, the water that is evaporated in the warmer regions within the material may either migrate towards the drier surface region or towards the cooler center region and then re-condense. The constant temperature at the center indicates re-condensation and evaporation occurring."

Roberts is currently working on quantifying the re-condensation that occurs during convective drying.

Pictures are linked to hi-res scans



John Roberts

The overall impact of this study is that it provides a better understanding of the mechanism(s) that control the drying process for foods, timber, and textiles. Consequently, higher quality products and more energy efficient drying processes can be developed.

"I am delighted that John has received the International Young Food Engineer Award," said Chang Y. Lee, chair of the food science department at the Geneva Experiment Station. "He is a young, very energetic, and imaginative scientist. Above all, he is a very pleasant person to be around. We look forward to his continued success and future scientific contributions to the field."

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