**ABE 557 F18**

Prediction of Couscous Moisture Diffusivity and Dryer Operating Conditions

Due Oct 19 Name:\_\_\_\_\_\_\_\_\_

Develop a working algorithm (detailed calculation process) using Math Lab to determine the diffusivity of moisture of a couscous product as a function of temperature, moisture, and porosity based on equilibrium moisture.

GAB model coefficients for couscous flour at various temperatures.

Semolina Farina

20\_C 35\_C 50\_C 60\_C 20\_C 35\_C 50\_C 60\_C

M0 11.8 6.45 5.92 3.53 9.16 6.01 5.23 4.76

K 0.65 0.71 0.72 0.76 0.65 0.69 0.71 0.73

C 4.21 8.77 10.01 200.1 14.06 31.95 37.04 137.0

M: Equilibrium moisture content (g/100 g);

aw: water activity;

M 0: monolayer moisture content;

1. Determine the relation for moisture diffusion as a function of temperature, and moisture.
2. Develop a GAB equation with Xm, Cg, and K as a function of temperature for your product. Plot Xm, Cg and K vs temperature.   Provide a plot of X vs aw at various temperatures for your product and compare with data given above.

2.   Determine Eb as a function of moisture content and temperature.  Plot Eb vs moisture at various temperatures.

3.   Determine Deff from Eq 48 of the Food Dehydration chapter (10).  Calculate Ea, Do (liquid water), Do (vapor water), from Diffusivity data at different temperatures given Geankoplis or other literature. Use K as given in Chp 10 p 661. Compare calculated Deff with Deff values found in literature.  Plot Deff vs. moisture at various temperatures ~~and plot Deff vs. moisture at various porosities~~.  Compare with data given in Chp 10 Table 10.7.

B Determine the dryer operating conditions (temperature and humidity) maximize shrinkage to dehydrate the soy product from 60% H2O wb to 10% H20 wb.

1. Plot Tg as a function of moisture content using the Fox equation and determine the temperature and humidity for one stage of the dryer. Tg of the soy solid is 410 K and  Tg of water is 134 K
2. The drying process is to be designed to produce a dense product by maintaining the surface conditions at least 10C above the Tg