Lean beef has been cut into steaks of 0.1m length, 0.06 m width, and 0.02 m thickness for freezing in an air-blast system at -20°C, h=22W/m2K. The initial temperature of product is 10°C and the final temperature is -10°C. Calculate the time required to freeze the product.
Figure 1: Coefficients in Plank’s Equation for brick or block shape
Figure 2: Chart showing the Planck's number versus Stefan's number for determination of $P$
Figure 3: Chart of Planck's number versus Stefan's number for determination of R
Figure 4: Chart showing the Biot number vs the shape factor for determination of different values of W.