
PROBLEM 10-9N QUESTION

Equivalent Diameter And Reynolds Analogy Problem Involving A Fuel Element

A liquid sodium test reactor fuel element configuration of equivalent diameter = 0.01m with a unique spacer is proposed for application in an innovative light water core to be designed for long fuel cycle. Hence, the tightly packed, uniquely spaced fuel configuration of the sodium reactor is to be used in this water reactor core.

Friction factor test results in sodium are available at $Re = 10^5$ indicate that $f = 0.08$. It is desired to find the turbulent heat transfer coefficient for this fuel element configuration at $Re = 10^5$ in the water reactor core. Relevant properties are given in Table I. Is it possible to achieve the desired prediction? If so, make the prediction. If not, explain why you think it cannot be done with the information given.

Table I. Fluid Properties at Operating Conditions

Fluid Properties		Sodium	Water
k	W/m°C	62.6	0.57
ρ	kg/m ³	818	740
μ	kg/ms	2.3×10^{-4}	9.6×10^{-5}
C_p	J/kg°C	1250	5.4×10^3