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C. W. TAN and C.-J. HSU: Mass transfer of decaying products with axial diffusion in cylindrical tubes	1887
C.-J. HSU: Theoretical solutions for low-Péclet-number thermal-entry-region heat transfer in laminar flow through concentric annuli	1907
R. A. GATER and M. R. L'ECUYER: A fundamental investigation of the phenomena that characterize liquid-film cooling	1925
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