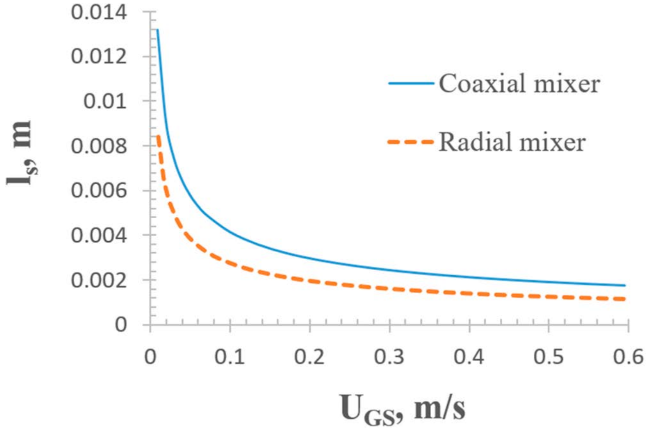

Figure 5.10 Absolute liquid slug length *versus* superficial gas velocity: U_{LS} = 0.030915 m s^{-1}, the superficial liquid velocity used in the crystallizer with coaxial mixing of hot solution with cold liquid; U_{LS} = 0.015457 m s^{-1}, the superficial liquid velocity used in the crystallizer with radial mixing of hot solution with cold liquid; Reynolds number $Re_L < 2100$.

Table 5.1 Comparison of calculated and experimental liquid slug lengths in crystallizer.

Type of mixer	U_{LS}, m s^{-1}	U_{GS}, m s^{-1}	Measured l_s, m	Predicted l_s, m
Coaxial	0.030915	0.056442	0.0060	0.00545
Radial	0.015457	0.035209	0.0040	0.00456

(5.14) gives a reasonable estimate of liquid slug length, with some underprediction for the configuration that had an upstream coaxial mixer and some overprediction for the configuration that had an upstream radial mixer.

Absolute recirculation times τ_{cir} *versus* superficial gas velocity U_{GS} are plotted in Figure 5.11 for the superficial liquid flow rates used for the coaxial and radial mixing experiments.[2] The values of τ_{cir} decline exponentially with U_{GS}, reflecting the similar decline in slug length.

5.3.2.3 Mixing Efficiency

To estimate the completeness of micro-mixing from the previous calculations, we introduce the micro-mixedness ratio α,[31] which is a measure of the perfectly mixed volume to the totally segregated volume in the mixing process. This ratio is defined in terms of a segregation variable X_s, which is 0 for perfect mixing and 1 for complete segregation:

$$\alpha = \frac{1 - X_s}{X_s}. \tag{5.16}$$