

1.5 times more than that of the impeller. Mixing conditions for the two crystallisers were selected so that the power dissipation rate was approximately equal, at 120 or 460 W m⁻³. The determinations of power density for both STC¹⁹⁵ and OBC¹¹⁹ are given in Section 3.3.6.

3.5.3.2 Seeded Experiments

For each experiment, 369 g NaClO₃ was added to the vessel containing 349 mL of distilled water. The solution was held at 40 °C for one hour under agitation to ensure that all solid particles had dissolved. After full dissolution, the solution was filtered using a Whatman glass fibre filter to remove any foreign particles, then cooled to 30 °C ($S = 1.006$, saturation temperature = 31 °C), *i.e.* 1 °C supercooling under controlled conditions. A single seed crystal of known handedness was dipped into the solution for three minutes, then removed. At the same time the agitation was stopped allowing crystals to grow overnight. Product crystals were collected, washed, dried and then analysed using a polarimeter. The left and right handed crystals were then separated, counted and weighed. Each experiment was done three times to establish the error margins within the data. The apparatus was thoroughly cleaned between trials using detergent (Fairy detergent) at 60 °C, rinsed with hot water and allowed to dry prior to use.

Table 3.3 below shows that the same results as Denk and Botsaris (1972)¹⁹⁶ in the stirred tank environment were obtained where 100% chiral symmetry breaking was achieved,¹⁹⁷ but the data in the OBC differed, with the EE of ~94%. While Kondepudi's secondary nucleation mechanism was still a dominant feature in the OBC due to fluid folding and unfolding, as well as collisions between nuclei and the surfaces of baffles, some sort of primary nucleation must also have occurred in order to produce the product crystals of the opposite handedness to the seed.

The cause of the primary nucleation was the scraping actions between the outer edge of the baffles and the inner surfaces of the wall of the column when the baffles are moving up and down the liquid phase,^{65,69} similar to scratching the bottom of a beaker containing supersaturated solution using a spatula in undergraduate chemistry labs. By reconfiguring the stirrer in the STC so that it touches the bottom of the vessel when rotating (Figure 3.17 left) – creating the scraping action, and at the same time, by leaving a small

Table 3.3 Summary of EE in both STC and OBC⁶⁵ with permission from American Chemical Society, Copyright 2012.

Seed	STC		OBC	
	Left hand	Right hand	Left hand	Right hand
EE (%)	100	100	94.3	94.2
Standard Deviation (SD)	0	0	0.6	1.8