above is what I understood about the relative dominance, *e.g.* convective mixing in macro crystallisers, diffusion mixing in micro channels and somewhere in between in meso devices.

Using the above analysis of the "internal" lengthscale, it is reasonably assumed that the Navier–Stokes equations are still applicable to flows in meso devices, as both the continuum and the no-slip boundary conditions are satisfied. Irrespective of the applicability and validity of the Navier–Stokes equations to diffusion driven flows, how is mixing achieved in a micro/meso channel with laminar or Stokes flows? The fact is that this phenomenon is not new and was demonstrated by Taylor[108–113] some 60 years ago; mixing in small channel devices is achieved in a number of ways:

a) Taylor diffusion allows mass transfer normal to the fluid flow;[110,112]
b) A longer channel or slower flow gives the fluid more time for diffusion;
c) Reversible flows due to oscillation change the directions of flow, shorten the diffusion length and lessen the needed diffusion time;[114]
d) Flow over bends induces vortex shedding with the same above effect;
e) When there are two liquids with different densities or concentrations, a density or concentration gradient is created, enhancing diffusion.[115]

3.3.6 Power Dissipation

How do we compare process performances (*e.g.* mixing, yield, conversion, selectivity, *etc.*) in different types of crystallisers or reactors? Taking the 100 m sprint for example, if you race against Usain Bolt, you will lose every time, because Usain Bolt is an elite athlete and the fastest sprinter in the world, while you are a club runner. We would accept the outcome without asking any questions. If Usain Bolt is racing against you on a motor bike, you will win the race and Usain Bolt would probably get very upset. Is this a fair competition? This leads to the key question: what is the *common* basis for comparison? From the above example, power consumed by the motor bike is more than that by the human being so the sprint time divided by the power consumption would provide a level playing field for comparison of different racing modes; in this case Usain Bolt will win it again.

These exact principles are applicable for comparison of process performance between different devices, *e.g.* OBR and STR. The basis for this is the power density or dissipation rate (W m^{-3}). This is the power dissipated into the liquid, or what liquid is experienced within the reactor. Note that it is not the electrical power of the motor that drives either oscillation or stirring.

Two main models deal with the power density in OBR: a quasi-steady flow model and an acoustic model. The former was initially proposed by Jealous and Johnson (1955)[116] and it has since been applied to the OBR.[117–119] It was defined by the equation: