It follows that when q approaches infinity, α is the (inverse) porosity. On the other hand, lowering the value of q decreases the magnitude of α.

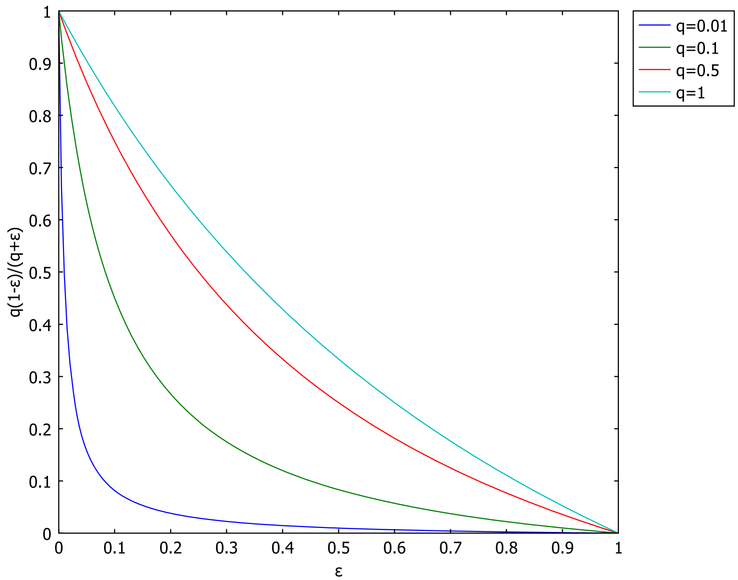

Figure 2: $q(1-\varepsilon)/(q-\varepsilon)$ *plotted as a function of* ε *for different values of* q.

Figure 2 shows $q(1-\varepsilon)/(q-\varepsilon)$ plotted as a function of ε for different values of q. This plot shows that lowering the value of q, increases the convexity of the force coefficient. For a low q value, an increase in ε around 0.5, imposes a small increase of the force coefficient, while for a higher value of q, a change in ε imposes an almost equal change for the whole range. Therefore, for a lower q value, the solution is not sharp at the interfaces. On the other hand, for small values of ε, the force term decreases rapidly when q is small, and thus affects the flow field to a much wider extent. In the limit when q approaches infinity, α as a function of ε is a straight line.

Results and Discussion

Figure 3 shows the velocity field in the empty channel. This is the starting point for the optimization.