CHAPTER V
CONCLUSION AND RECOMMENDATION

In this work, a capillary flow apparatus has successfully shown to be a tool for investigating barium sulfate deposition as can be seen from the reproducibility of the experiments. The observed trend for pressure drop and concentration trajectory indicated that the deposition has occurred in the capillary. The results reveal that there is a detection time for barium sulfate deposition. For the first time, dendritic crystals of barium sulfate deposits generated in laboratory have been directly observed. An increase in capture efficiency is likely because the surface area inside the capillary increases over time due to dendrite formation. The SEM images show that the deposit is non-uniform radially and significantly thicker at the outlet than at the inlet.

The deposition profile was studied by performing deposition experiments at different capillary lengths. The pressure drop in each section can be calculated by decoupling the pressure drop profile into sections. The experimental results were used to aid in identifying in which section of the capillary most of the deposits occur. As time elapses, the deposit moves toward the entrance of the capillary when the flow rate is increased. In addition to dendrite formation, deposit displacement makes depletion effect of concentration less significant.

This work will benefit the industry to screen scale inhibitor as pressure drop trajectory in capillary is commonly used. An increase in pressure drop might be either due to change in inner diameter due to deposition or due to drag force due to shape of deposit. Moreover, different inhibitors might play different role in the deposit formation, for example, inhibitor A enhances dendrite formation while inhibitor B reduces formation of dendrite. Therefore, pressure drop for different inhibitors cannot be directly compared in order to assess inhibitor efficiency.

One of the possible future work is investigation of barium sulfate deposition in capillaries with different inner diameters, materials, and flow rates. In order to study the nucleation of barium sulfate, precipitated particles could be filtrated to see if homogeneous nucleation occurs in the system. Ion-selective electrode for barium ion could be applied for measuring barium ion concentration.