

Chapter 7

Recommendations for Future Work

Based on the results obtained in the present work, the following recommendations may be made for future work:

1. The results obtained in the present work suggest that the origin of the hydration force is related to the water structure on the silica surface. It also seems that certain solutes like methanol and ethanol may displace some or all of the bound water, thereby, reducing the hydration force. It would be of interest to confirm this phenomenon spectroscopically, i.e. can the decrease in the amount of bound water at the silica surface in the presence of alcohols be observed first hand? If so, this would confirm directly the mechanism proposed in the present work.
2. The Ca/Mg-oleate-silica system was successfully studied in the present communication. Nevertheless, it seems that oleate adsorbs on silica only when it is activated by these two ions. Other cations like Pb^{2+} , Cu^{2+} and Fe^{3+} were studied during the course of this investigation, however, none of these were successful in activating silica for oleate adsorption. It should be emphasized that this is not because the cations do not activate silica, on the contrary, most of the cations are known to reverse the charge on the silica surface. It is probably related to the fact that the basic oleate complex may form only with Mg and Ca. Hence, it is proposed that another anionic collector, for e.g., sulfonate, be used instead to enable hydrophobic force measurements with different cations. This collector has been observed to respond to various cations. It would be of interest to see if the same magnitude of hydrophobic force is observed for other cations as well.
3. An important finding of the present study was that the range of the hydrophobic force between hydrophobic surfaces may be diminished by the adsorption of the singly charged hydroxo complexes. However, no evidence for this was observed from contact angle

measurements on silanated silica, which suggests that D_2 value be more sensitive to small changes in polarity at the surface. Thus, measuring D_2 may be a powerful technique to study some important phenomena like the depression that occurs in certain pH ranges during floatation in the presence of hydrolyzable cations. This technique can also be used to study ways of preventing depression. As has already been done at CCMP, one way to do this might be to add complexing agents like ammonia, which may tie up the cation and hence, reduce the amount of the hydroxo complex adsorbing on the surface. It would be of interest to see, if the hydrophobic force actually recovers to its original range in the presence of such complexing agents.

4. Finally, it is proposed the adsorption isotherms of various cations be studied on different substrates to validate the model presented here for the adsorption of the singly charged hydroxo-complex on a substrate. The present model can be used to fit the adsorption isotherms on both polar and nonpolar substrates and to obtain the free energy of lateral interactions for different cations. If this value for a particular cation is the same for a variety of substrates and it matches with that calculated from association reactions in the bulk, the present model will stand validated.