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Appendix A

Calculation of rates from concentration time trajectories for the initial dissolution rate experiments

Rate calculation of HBr

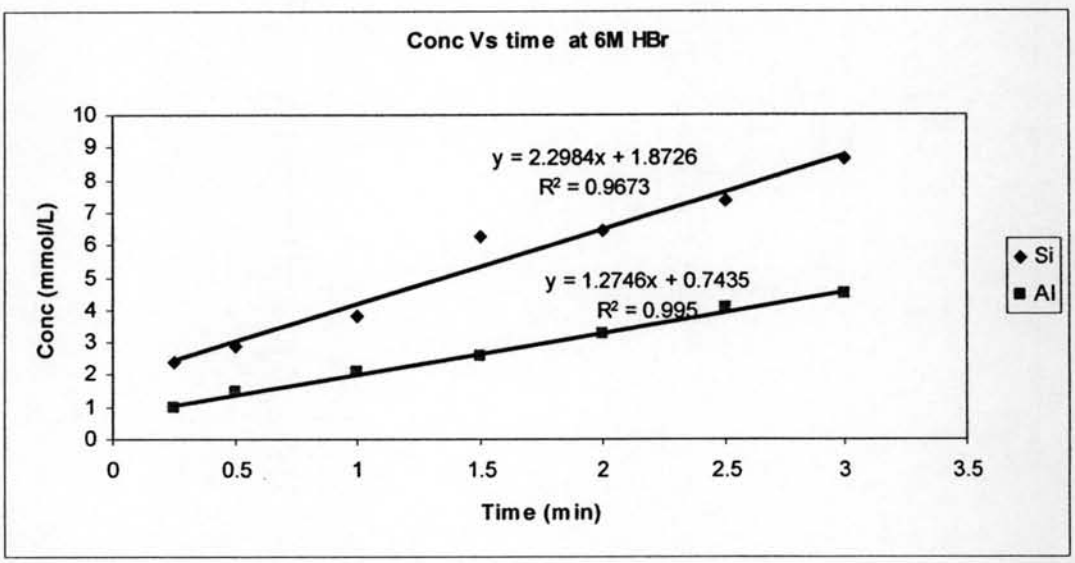


Figure A1.1 Conc vs time for Si and Al for analcime dissolution in 6M HBr.

From Figure A1.1 the slope of the lines give the reaction rates at 6M HBr for Si and Al. The rate for Si is 2.298 mmol/L.min while for Al, it is 1.274 mmol/L.min. the amount of analcime used is known, so, the rates are converted to mmol/g.min. Similarly at all the other molarities, the rates are found to finally give the rate Vs [H+] concentration for different acids. The data was then fit to the Hanes-Woolf plot to give the kinetic parameters and then the experimental points were plotted along with the model (Figures A1.2 and A1.3).

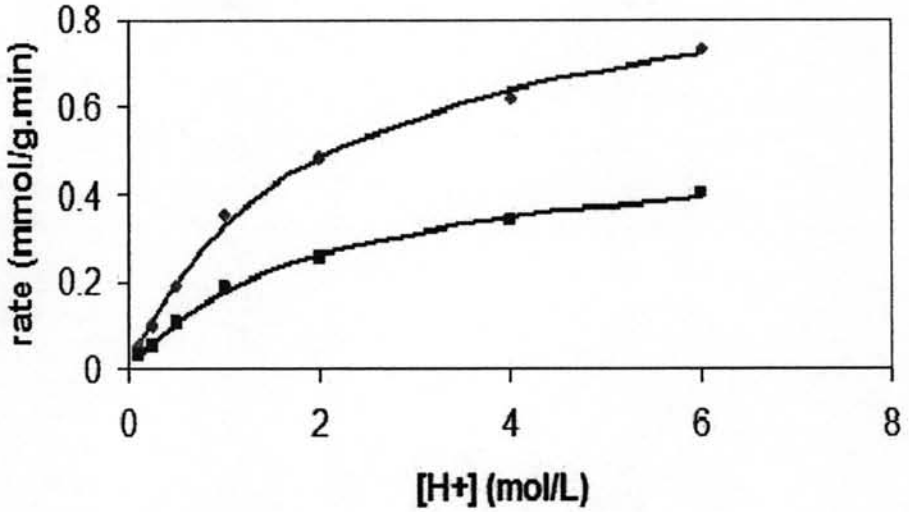


Figure A1.2 Rate Vs [H+] for analcime dissolution in HCl

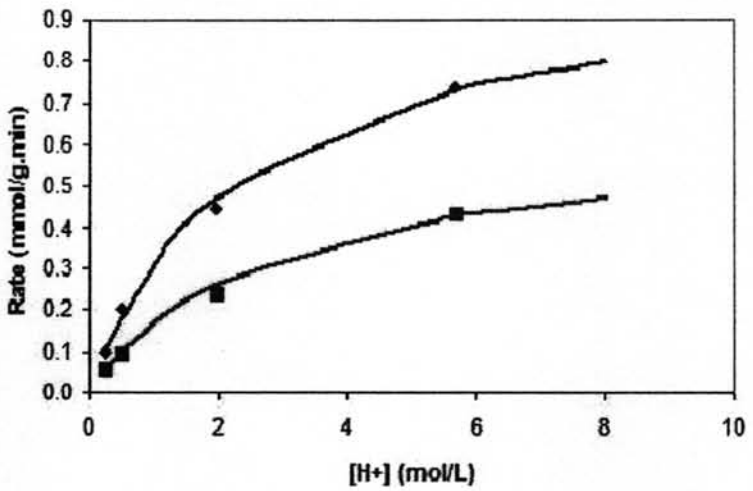


Figure A1.3 Rate vs [H+] for analcime dissolution in nitric acid

Appendix B

SEM micrographs of washed and unwashed particles partially dissolved in sufuric acid

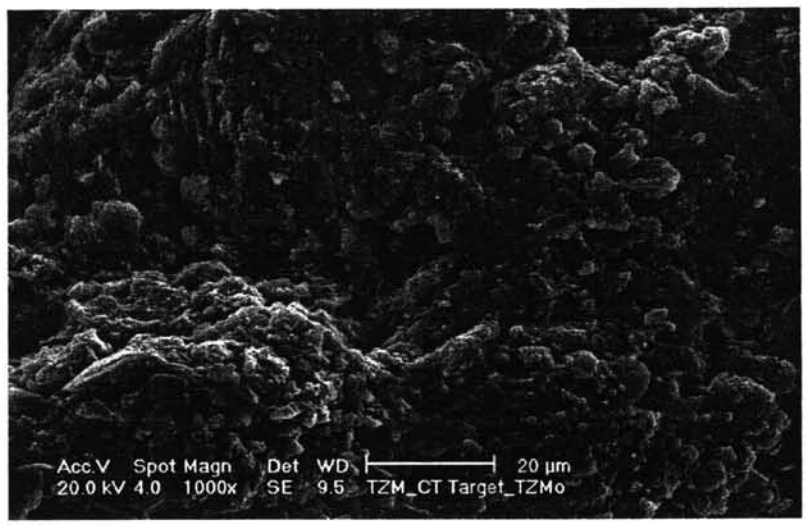


Figure B1 SEM of unwashed particles partially dissolved in sulfuric acid during analcime dissolution

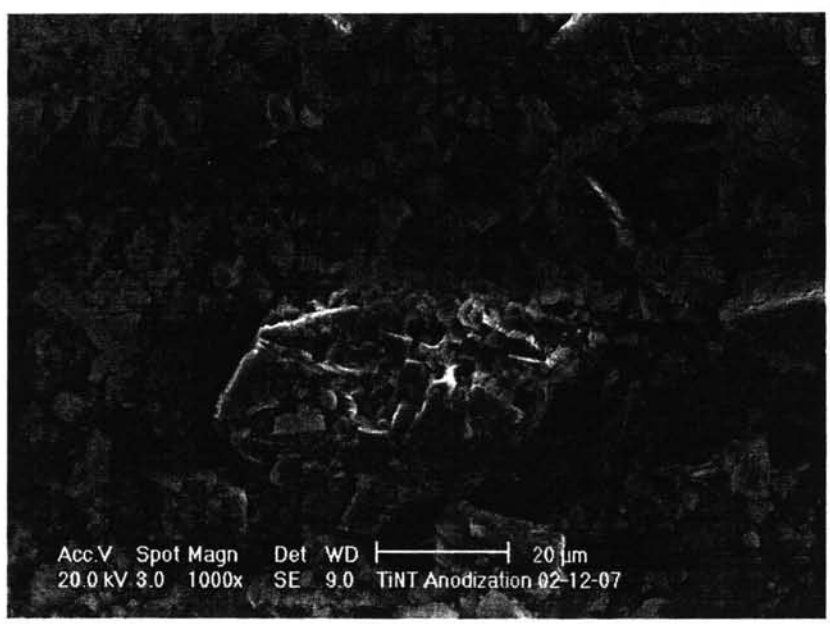
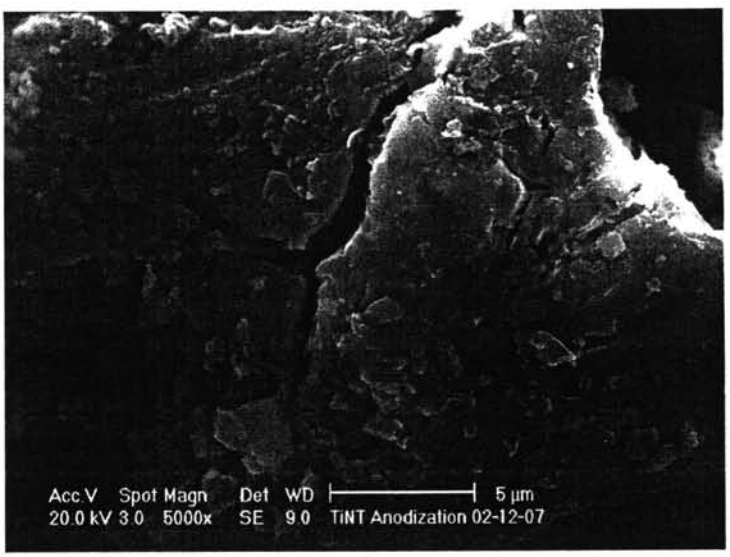


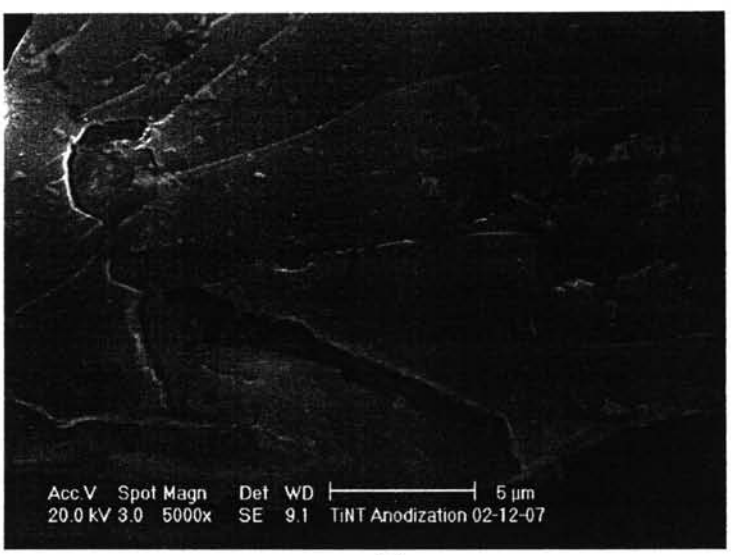
Figure B2 SEM of washed particles partially dissolved in sulfuric acid during analcime dissolution

Appendix C

SEM micrographs of the partially dissolved analcime particles in sulfuric acid

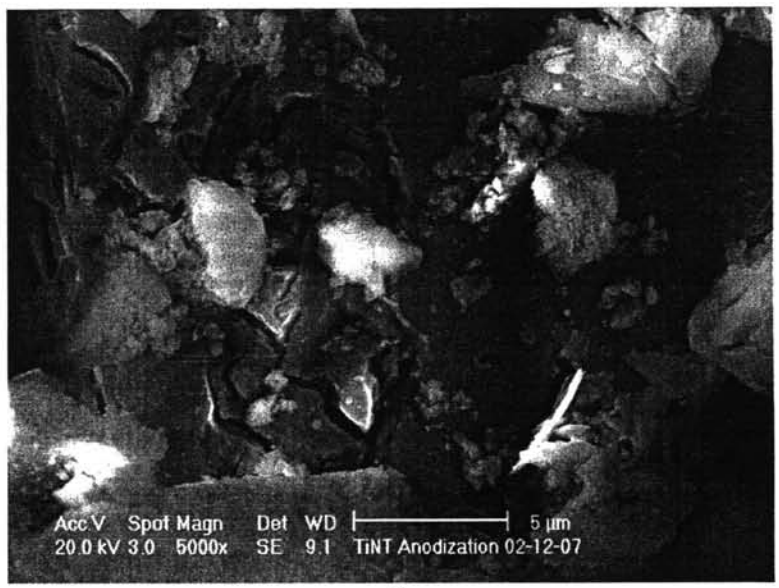


a)

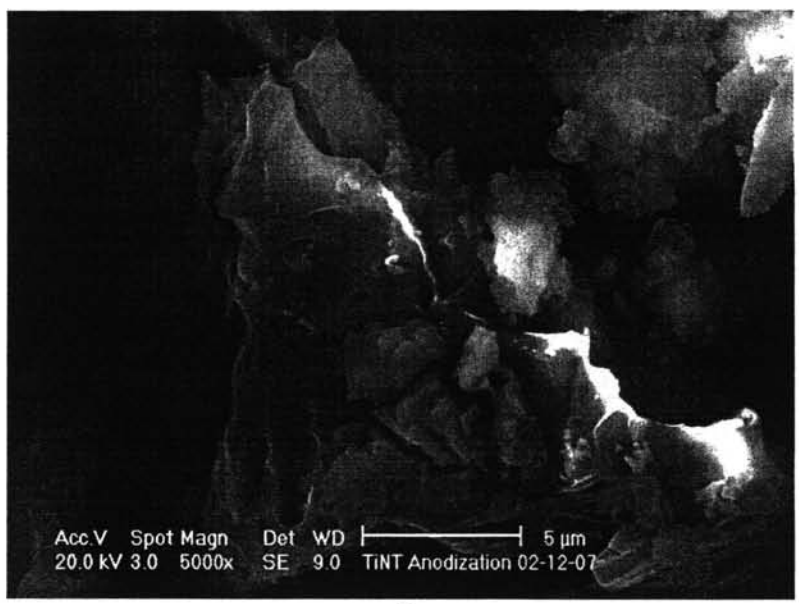


b)

Figure B1 SEM micrographs of partially dissolved analcime particles in the dissolution predod

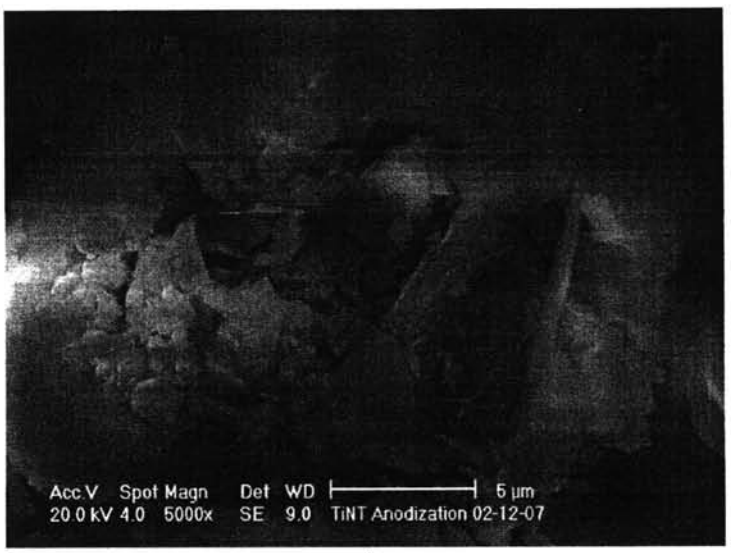


c)



d)

Figure B2 SEM micrographs of analcime particles partially dissolved in sulfuric acid from the Silica plateau region



e)

f)

Figure B3 SEM micrograph of analcime particles partially dissolved in sulfuric acid and coexisting with the precipitate.

As suggested by Hartman and Fogler (2006), the particles in sulfuric acid show the same behavious as in HCl. First the etched pits and channels are formed in the particles and then these channels grow and the particles are completely broken down and remain undissolved and finally coexist with the precipitate.

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