Time series data reduction for the Chang'E-1 Gamma-ray Spectrometer

LIYAN ZHANG[1]*, JIANZHONG LIU[1], YONGLIAO ZOU[1], JI SHEN [1], GUANGLIANG ZHANG[1], JIN CHANG[2], CHUNLAI LI[1] AND ZIYUAN OUYANG[1]

[1]National Astronomical Observatories, CAS, 20A Datun Road, Beijing 100012, China (*correspondence: zhangliyan97003@bao.ac.cn)
[2]Purple Mountain Observatories, CAS, 2 Beijingxi Road,Nanjing,Jiangsu Province 210008, China

Introduction

The Chang'E-1 Gamma-Ray spectrometer(CE1-GRS) is developed by Purple Mountain Observatory, Chinese Academy of Sciences. Its heart is a 118mm diameter by 78mm long cylinder of CsI. The CE1-GRS CsI crystal measures gamma-ray having energies from 0.3 to 8.9MeV.The measured energy resolution is 8.27% at 662keV and scales as $E^{1/2}$ (where E=gamma-ray energy). The spectra is measured with 512 channels. The collection time for main crystal is 3 seconds. The main crystal is surrounded by 3mm thickness anticoincidence crystal of CsI.

Primary Processing

CE1-GRS have returned a great deal of gamma-ray data from the Moon. It is importance to provide a thorough description of CE1-GRS data reduction processes that convert raw counts rate data into fully corrected time-ordered gamma-ray spectra that are used to directly derive elemental maps. This processing includes steps such as channel processing, deadtime correction, gain correction, energy calibration, geometric correction, orbit altitude normalization, galactic cosmic ray correction and binning data into equal-area pixels.

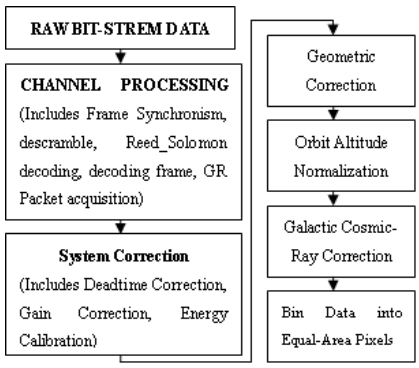

Figure 1: Data reduction summary flowchart

[1] Lawrence *et al*. (2004) *JGR*. **109**, E07S05, 245-254. [2] Reedy *et al*. (1973) *JGR*, **78**(26), 5847-5866. [3] Reedy *et al*. (1972) *JGR*. **77** (4),537-555.

Adhesion of *Shewanella oneidensis* MR-1 to iron (oxy)(hydr)oxides: Microcolony formation and isotherm

M. ZHANG[1], BR. GINN[2], .T.J. DICHRISTINA[2] AND A.G. STACK[1]*

[1]School of Earth and Atmospheric Sciences, Georgia Institute of Technology, mengnizhang@gatech.edu
[2]School of Biology, Georgia Institute of Technology

Understanding the physical attachment of dissimilatory metal reducing bacteria to a mineral substrate may be critical to understanding the rate and extent of respiration. Here, the adhesion of *Shewanella oneidensis* MR-1 cells to mineral surfaces was examined using a novel confocal microscopy method and a live-dead dye. Specifically, planar iron (oxy)(hydr)oxide particulate coated glass slides were used that allowed us to directly observe adhered cells and revealed their spatial distribution. We quantitatively estimated cell surface density at bulk densities ranging from 10^5 cells/mL to 2×10^9 cells/mL. It was found that adhered cells formed microcolonies at bulk cell densities larger than ~10^8 cells/mL, whereas at lower bulk densities, the adhered cells formed an evenly distributed, homogeneous monolayer. Due to this complexity, the overall attachment behavior was not modeled well with either a simple Freundlich or Langmuir isotherm over the entire range of bulk cell densities. At low bulk cell densities, the cell adhesion behavior was modeled well by a Langmuir isotherm. To account for the microcolony formation above a critical bulk cell density, a second Freundlich-type isotherm was then added in a feedback mechanism to realistically describe the relationship between adhered single cells and microcolonies.

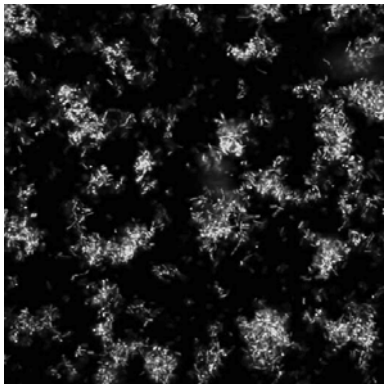

Figure 1: Microcolony formation at bulk cell density 1×10^9 cells/mL.