

Reflectance and Emission Spectroscopy of Brazilian magmatogenic and sedimentogenic phosphate deposits

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RESUMO: Given the importance of phosphate minerals in the fertilizer industry, reflectance and emission spectroscopy studies were developed to determine the possibility of recognizing these minerals through reflectance and emission spectroscopy. Thoroughly selected samples of the Catalão I Alkaline Carbonatitic Complex (magmatogenic), Goiás State and Rocinha and Lagamar Mines (sedimentogenic), Minas Gerais State, were collected in cross-section, vertical profiles and core drills. The goal was to see how the variations in phosphate content and other mineral phases behaved in the Visible (VIS), Near Infrared (NIR), Short Wave Infrared (SWIR) and Thermal Infrared (TIR) portions of the electromagnetic spectrum. Samples were dried for 24 hours at 50°C to avoid the presence of humidity and recrystallization of calcite. Afterwards, the rocks were measured using the ASD Fieldspec Pro[©] VIS-SWIR Spectrometer (350-2500nm) and a μ FTIR[©] TIR Spectrometer (2000-14000nm). Samples were then crushed to powder size, measured again for reflectance and emissivity. Mineralogical and chemical controls were implemented through X-Ray Diffraction and X-Ray Fluorescence to provide ground truth to the spectral responses. Obtained spectra in the VIS, NIR, SWIR and TIR spectrum were assembled in spectral libraries using ENVI 4.7[©]. These spectral libraries were then re-sampled to the ASTER sensor on the VIS, NIR SWIR and TIR regions. From the collected rocks, the most interesting responses to map phosphate minerals through remote sensing appear in the VIS and TIR regions. SWIR features are shadowed by carbonate minerals. TIR region shows distinctive absorption features for P-O structures at 8.5 μ m and 10.5 μ m (Chlorapatite and Fluorapatite). Aluminous phosphates were not detected on raw samples. Further refining of the samples (Mineral separation of phosphates to obtain pure endmembers of phosphate minerals) and data (Principal Component Analysis and Mixture Tuned Matched Filtering on ASTER images of the selected areas) are being developed to determine the ability of commercial satellite images to identify phosphate rocks

PALAVRAS CHAVE: Remote Sensing, Spectroscopy, Phosphates