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The miniaturized Mössbauer Spectrometers MIMOS II on MER: Four Years of operation

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The two Miniaturised Mössbauer Spectrometers MIMOS II on board the two Mars Exploration Rovers “Spirit” and “Opportunity” have now been collecting important scientific data for more than four years. The spectrometers provide information about Fe-bearing mineral phases and determine Fe oxidation states. The total amount of targets analized exceeds 600, the total integration time exceeds 260 days for both rovers. Since landing, more than five half-lives of the Co^{57} MB sources have past (intensity at the time of landing $\sim$150 mCi). Current integration times are about 50 hours in order to achieve reasonable statistics as opposed to 8 hours at the beginning of the mission.

In total, 13 different mineral phases were detected: Olivine, pyroxene, hematite, magnetite and nanophase ferric oxide were detected at both landing sites. At Gusev, ilmenite, goethite, a ferric sulfate phase and a yet unassigned phase (in the rock “Fuzzy Smith”) were detected. At Meridiani, jarosite, metallic iron in meteoritic samples (kamacite), troilite, and an unassigned ferric phase were detected. Jarosite and goethite are of special interest, as these minerals are indicators for water activity. In this abstract, an overview of Mössbauer results will be given, with a focus on data obtained since the last martian winter.

The MER mission has proven that Mössbauer spectroscopy is a valuable tool for the

in situ exploration of extraterrestrial bodies and for the study of Fe-bearing samples. The experience gained through the MER mission makes MIMOS II a obvious choice for future missions to Mars and other targets. Currently, MIMOS II is on the scientific payload of two approved future missions: Phobos Grunt (Russian Space Agency; 2009) and ExoMars (ESA; 2013).