ENANTIOSELECTIVE INSTRUMENTS ONBOARD ROSETTA LANDER (COSAC) AND MISSION EXOMARS (MOMA) W. H. P. Thiemann[1], J. H. Bredehoeft[2], U. J. Meierhenrich[3], F. Goesmann[4] [1]University of Bremen, Institute for Physical Chemistry, Leobener Str. NW2, D-28359 Bremen, Germany, thiemann@uni-bremen.de, [2]University of Bremen, Institute for Applied and Physical Chemistry, Leobener Str. NW2, D-28359 Bremen, Germany, jhbredehoeft@uni-bremen.de, [3]University of Nice-Sophia Antipolis, LCMBA, Faculté des Sciences, 28 Avenue Valrose, F-06108 Nice CEDEX 2, France, [4]Max-Planck-Institute for Solar System Research, Max-Planck-Straße 2, D-37191 Katlenburg-Lindau, Germany

Introduction: The idea of looking for chirality as a marker for detecting life on extraterrestrial bodies is an old one, in the past we have made several proposals for such an endeavour. Yet so far, space missions had never included enantioselective instruments to distinguish between chiral organic molecules. This chiral distinction is of crucial importance to understanding the abiotic versus biotic origin of organic molecules that will possibly be detected in extraterrestrial samples in situ. We participated in the development of the enantioselective GC-MS device COSAC onboard Rosetta Lander Philae that has been designed to identify and quantify enantiomers on a cometary surface.[1,2] Philae's landing maneuver is scheduled for 2014. A similar type of enantioselective GC-MS is in preparation for mission ExoMars with the ambitious objective to resolve chiral organic molecules in surface and subsurface samples of Mars. Launch and arrival of mission ExoMars are planned for 2018. We will describe the developed enantioselective techniques for COSAC and MOMA including sample acquisition, derivatization, and resolution by space-resistant chiral stationary phases, as well as time-of-flight mass spectrometric detection. We present results of enantioselective analyses of representative test samples with special emphasis on amino acids[3], and we will discuss potential results to be obtained by space missions Rosetta and ExoMars.

References:

[1] Thiemann W.H.-P., Meierhenrich U.: ESA Mission ROSETTA Will Probe for Chirality of Cometary Amino Acids. Origins of Life and Evolution of Biospheres 31 (2001), 199–210.

[2] Goesmann F., Rosenbauer H., Roll R., Szopa C., Raulin F., Sternberg R., Israel G., Meierhenrich U., Thiemann W., Muñoz Caro G.M.: COSAC, The cometary sampling and composition experiment on Philae. Space Science Reviews 128 (2007), 257–280.

[3] Meierhenrich U.J.: Amino Acids and the Asymmetry of Life – Caught in the Act of Formation. Springer, Heidelberg Berlin New York (2008).