DEVELOPMENT OF A HARSH ENVIRONMENT GAS SENSOR ARRAY FOR VENUS ATMOSPHERIC MEASUREMENTS. D. B. Makel[1] and S. Carranza[2], [1]Makel Engineering, Inc., 1585 Marauder Street, Chico CA 95973, dmakel@makelengineering.com, [2]Makel Engineering, Inc, scarranza@makelengineering.com

Introduction: The development of a harsh environment tolerant gas sensor array for atmospheric analysis in future Venus missions is described. The work is being conducted under a NASA Phase II SBIR program. The instrument under development is a compact and robust chemical sensor array for (1) profiling chemical composition of the Venus atmosphere in a dropsonde mission and (2) providing gas composition measurements as part of the long lived lander with meteorological monitors. The goal is to provide information on a wide range of important atmospheric gases including SOx OCS, CO, NO O_2, NO, HF, HCl, H_2 and water vapor concentrations in order to complement other measurement systems that were targeted in the 2009 Venus Flagship Mission Study [1] such as a GC-MS, nephelometer, or camera/optical detector.

Significant development of chemical instrumentation will be needed to meet the mission needs for composition measurement and profiling of key species in the Venus atmosphere by future missions. A multi-species, chemical sensor array using miniaturized, robust, high temperature (greater than 500 C) solid electrolyte chemical sensors can significantly augment decent phase and surface data and provide useful instrumentation options during mission development. The key components and the conceptual integration of the sensor array and high temperature electronics into a dropsonde is show in Figure 1.

The sensors used in the array leverages previous efforts by Makel Engineering and NASA on robust high temperature (greater than 500 C) sensors including SiC sensors and sensors developed for NO, CO, O_2, H_2O, H_2 for fire detection and jet engine emissions [2]. Those sensing technologies have been extending to additional sensors of interest for Venus (OCS, SOx, HF, HCl, HCN) and other locations in the solar system. First generation prototypes of the sensor array and electronics have been developed. Testing of both sensor and high temperature capable electronics (250 to 300 C) will be conducted at the NASA Glenn Extreme Environment Rig (GEER) to provide simulation of the Venus atmosphere at different conditions.

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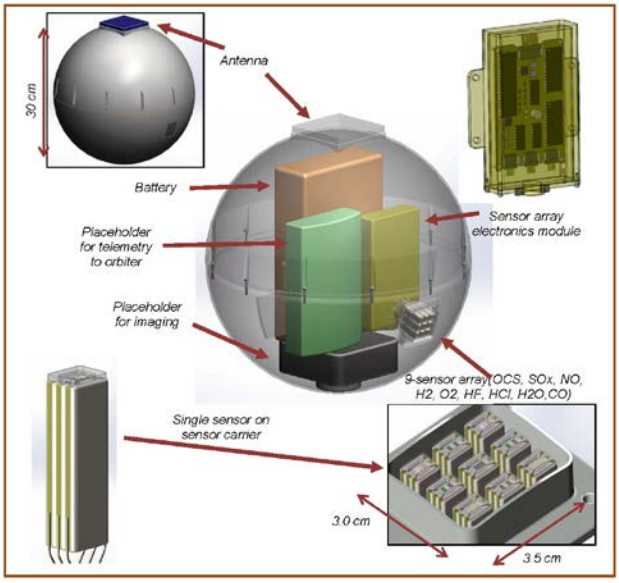

Figure 1. Concept drawing of sensor array integration with dropsonde for Venus atmospheric chemistry profiling.

References:

[1] *Venus Flagship Mission Study*, Final Report, JPL, *NMO710851*

[2] Hunter, G. W., et al (2010) *SPIE Defense, Security, and Sensing*. Int. Soc. Optics and Photonics.