

THE 2007 PHOENIX MARS SCOUT MECA WET CHEMISTRY LABORATORY

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The MECA *Wet Chemistry Lab* (WCL), originally developed as part of the *Mars Environmental Compatibility Assessment* (MECA) package for the since cancelled 2001 Mars Surveyor Program lander, is one of the instruments included in the upcoming 2007 Phoenix Mars Scout mission. In addition to investigating the geochemistry, the MECA-WCL directly addresses a variety of astrobiology goals. Among these is its search for habitable zones and biosignatures by, (1) identifying potential chemical energy sources available to support life, (2) determining whether the subsurface geochemistry is hostile to life, and (3) identifying the potential of the geochemical environment to preserve paleontological evidence.

Its capability to achieve astrobiologically oriented goals is provided by an array of electrochemically-based sensors. The array consists of *ion selective electrodes* (ISE) for inorganic anions, cations, and gases, including calcium, sodium, potassium, magnesium, chloride, bromide, nitrate, perchlorate, carbonate, dissolved CO₂, O₂, and pH. It also includes special electrodes for conductivity, oxidation - reduction potential (ORP), *anodic stripping voltammetry* (ASV) for heavy metals such as Cu²⁺, Cd²⁺, Pb²⁺, Hg²⁺, and *cyclic voltammetry* (CV) for identifying and analyzing possible reversible and irreversible redox couples.

The 2007 Phoenix lander includes four WCLs, each consisting of an upper sample/water/reagent *dispensing unit* with a stirrer and a lower *analysis cell* (beaker) containing the integral sensor array. Each WCL contains a drawer which can accept a soil sample from the robotic arm and deliver approx. 1 cc of soil sample to 25 cc of water containing a low concentration of inorganic ions as a standard and also acting as a leaching solution. In addition to being flight qualified for the MSP'01 mission, the WCL has been rigorously and successfully tested after being frozen for over 18 months, thawed and refrozen dozens of times, and after sitting on the shelf for over a year at room temperature. The figure at the right shows the upper (dispenser) and lower (beaker) assemblies.



The WCL for the 2007 Phoenix, and future Mars missions, provides a low mass/energy device for obtaining unique information about the potential habitability and history of the aqueous and geochemical environment.