Hawaii Corrosion Laboratory (HCL)
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State-of-the-art corrosion and materials characterization facility at HCL

The HCL established ten corrosion test yards on Oahu and the Big Island in agricultural, alpine, arid, industrial, severe marine, mild marine, rain forest, and volcanic environments.

Staff of researchers, engineers, graduate students, undergraduate students, and summer interns

• Nanoindenter
• Scanning Electron Microscope
• Scanning Probe Microscope
• 3D non-contact profilometer
• Energy Dispersive X-ray Analyses
• FTIR Microscope
• Raman Microscope
• Secondary-Ion Mass Spectrometer
• X-Ray Diffraction
• Scanning Kelvin Probe
• Corrosion and Electrochemical Testing, etc.

Current and Recent Sponsors
• USAF/Wyle
• OUSD/USAFA
• ONR
• USMC/ORNL
• US Army/Qinetiq/Vencore
• Nippon Steel and Sumitomo Metals Corp
• SPAWAR
• Haseko
Hawaii Corrosion Laboratory (HCL)
Corrosion of Advanced Materials and Systems

HCL developed the SiloXel™ coating for aluminum alloys – replacement for hexavalent chromium treatments

HCL SiloXel™ coating licensed by US company

Metal-matrix composites: Al/Al₂O₃

Ceramic-metal interfaces
TiB₂, B₄C, SiC, Si₃N₄, AlN

Al and Mg Alloys

Friction stir welded AA 6061—AA 5086, etc.

Polymer-matrix composite—metal couples

After exposure to GM 9540 accelerated corrosion test
Hawaii Corrosion Laboratory
Portable Exposure Racks

HCL-designed Portable Exposure Rack (PER)

World-wide PER deployment: Hawaii, Japan, Korea, Guam, US Mainland, Italy, Germany, Kuwait, Panama

PER data used for the development of corrosion models

Accessing corrosivity of environments for planning

PER at Camp Fuji

PERs on LSV

PER in intertidal zone
Hawaii Corrosion Laboratory

Corrosivity Sensor

Development of Sensors at the HCL

HCL Corrosivity Sensor on USMC trucks

Tracking corrosion activity

Sensor suite mounted to FMTV and HMMWV
Hawaii Corrosion Laboratory

Discarded Military Munitions

Corrosion in Biofuels

• Future Work
  – Navy Interest
  – Corrosion Monitoring
    • Sensors
    • PERs
  – Corrosion Modeling
    • Predicting Corrosion Morphology
    • Massive amounts of experimental data available for model validation
      – Many material systems (e.g., MMCs, ceramic-metal couples, metal-metal couples, different alloys)
      – Diverse environments (e.g., different microclimates, various marine severities, volcanic, intertidal, immersion, biofuels)

• Thank You