530

AN ADVANCED ULTRACLEAN ENVIRONMENT FOR PROCESSING POLAR SAMPLES

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The determination of lead isotopic ratios in picogram amounts in Antarctic ice places extreme demands on all aspects of the measurement process, from the collection of the sample to the final analysis in the mass spectrometer. The reliability and precision of measurements on environmental samples of lead is largely determined by the size of relative contributions from extraneous sources, such as sampling tools, storage containers, digestion vessels, chemical reagents and the laboratory air. In this paper we describe an Advanced ultraClean Environment (ACE) that we have recently constructed at Curtin University to minimize contamination from the laboratory air. This development was supported by the Australian Research Council.

The guiding principles followed in designing this facility are that: 1. Air particle cleanliness exceeds Class 5 (ISO 14644-1 standard) (~ U.S. Federal Standard 209E Class 100), 2. There is limited use of metal and, 3. The work spaces are individualized. The final design includes 5 work areas located within a particle "free" exclusion space. Also included are a cold laboratory for decontaminating ice and a cold store for samples. Particles are filtered through HEPA (High Efficiency Particle Air) filters and extensive recirculation of air occurs in all areas in the facility. Deionised water (18.3 MΩ-cm) is piped to all work areas where it is further purified by sub-boiling distillation in quartz stills. Particle concentrations are monitored continuously throughout the facility. In an emergency electrical power is provided by a diesel generator.

Fresh air enters the facility at ~$6x10^3$ m^3/h first through activated charcoal filters then HEPA filters. A preliminary *Classification of Air Cleanliness* (ISO 14644-1) in the *as-built* state gave Class 4 for the Control Room and main Exclusion Space and Class 3 for other areas (based on particle sizes >0.3 micron). Open beaker (15 mL) collection of sedimenting particles at 6 locations in one work area yielded averages of 0.4 pg/day lead and 0.8 pg/day Ba.