A battery management system for use with a battery under test is disclosed. The system includes a container configured to hold the battery. The system also includes a stress/strain sensor. The container is configured to hold the battery in fixed relationship with respect to the stress/strain sensor. A processor is coupled to the stress/strain sensor, the processor being configured to measure the stress/strain on the battery and determine the state of health (SOH) of the battery based on the measured stress/strain and previously stored SOH relationship data for the battery. The processor may be configured to determine a state of charge (SOC) of the battery based on the measured stress/strain, the SOH of the battery and previously stored SOC relationship data for the battery.