Instruments for gamma irradiation and proton beam applications

The University of Manchester Dalton Cumbrian Facility has ion accelerators with beam lines and a Cobalt-60 gamma irradiator. Cormet has built high temperature high pressure testing cells for both the irradiation sources.

The ion beam line will be used for the radiology and corrosion studies. A thin metal film window separates a proton beam and a testing cell with 350°C temperature and 20 MPa pressure water. A recirculation loop maintains the testing cell pressure and the water chemistry and transports the radiolysis products to gas separation devices and further to ion spectrometer.

There are two kind of testing cells. The *proton beam testing cell* has a window, water inlet and outlet lines and a heating device. Because the metallic window of the *electrochemical proton beam testing cell* is electrically isolated, it can be electrochemically polarized using the reference and counter electrodes located in the very same testing cell. This setup is used to study the effect of various surface films on the radiolysis products.



The Cobalt-60 gamma irradiator lets researchers understand the mechanistic effects of gamma radiation on exposed materials. It is shielded with massive lead walls. Cormet has built two autoclaves to be positioned in the chamber: a regular autoclave for weight loss and radiolysis tests and an autoclave with electrochemical tools. The recirculation loop is taking care of the autoclave pressurization, the water flow heating, the water chemistry monitoring and preparation and the gathering of the radiolysis products.

The Co-60 irradiator with an autoclave



The recirculation loop



The proton beam testing cell.