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Technologies to rapidly quantify surface activity with minimal worker contact would dramatically decrease the radiation dose a radiation worker receives in assessment and cleanup operations, while obtaining a clear image of exactly where dispersed contamination is located. LLNL efforts in the development of the Photochromic Radiation Dosimeter and the Imaging Assessment System will be described. Initial use of these technologies in decontamination and decommissioning of contaminated facilities demonstrates several significant advantages over standard techniques such as survey meters and swipes.

The Photochromic Radiation Dosimeter. We are developing a fieldable standoff dosimeter that is read out using active laser interrogation at distances exceeding 10 m. This dosimeter combines scintillation with a photochromic medium that converts upon absorption of scintillation light. The radiation dose is stored in the photochromic layer and read out by a laser. We synthesized and characterized more than a dozen different photochromic materials (two are shown in Figure 1) before identifying the ideal candidate currently being used for the sensors.

The Imaging Assessment System. An optical viewer capable of imaging surface activity, even within a sunlit background, is also under development. Specialized optical elements allow imaging of airglow from radiological materials at standoffs of 3-10 m. An example of the glow emanating from the surface of an alpha particle source is shown in Figure 2. We are also formulating scintillating encapsulating coatings that can be deposited on radioactive surfaces to enhance their optical signals, allowing imaging at low activity levels using the same viewer.

Figure 1. (Left) A photochromic material in which a permanent dose may be stored in the form of green molecules.
(Right) A reversible photochromic material that may store a dose as the purple form but can be converted back to the yellow "unwritten" form upon laser readout.

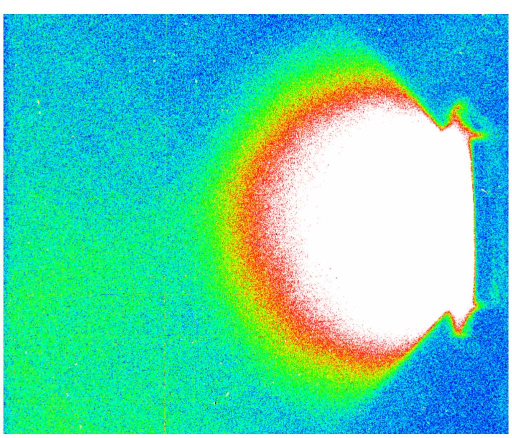

Figure 2. Side-on view of an alpha-contaminated surface shows a bright optical signal emanating from the surface.

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