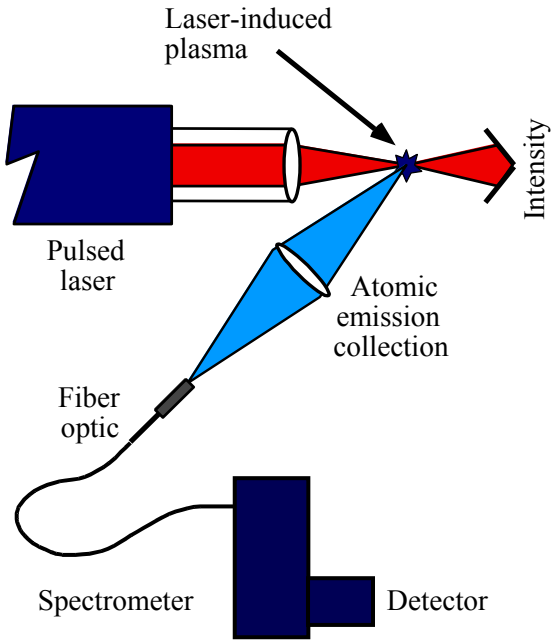
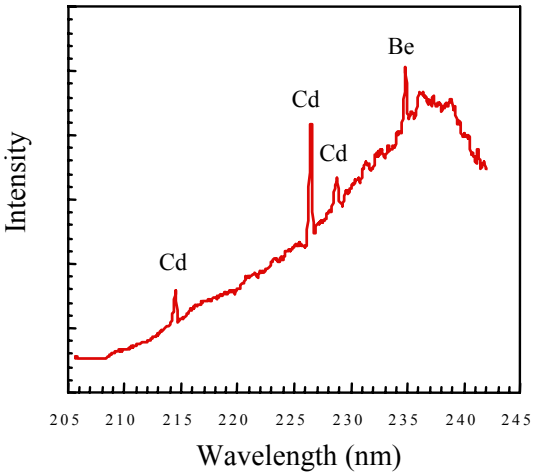
Laser-Induced Breakdown Spectroscopy (LIBS)

for Exhaust Gas Trace Species Detection





- Line position provides species identification
- Line intensity provides species concentration

SPA, with subcontractor University of Maryland at College Park, is developing a Laser-Induced Breakdown Spectroscopy detection system for engine exhaust monitoring to determine the health of turbine engines

- Technology
  - The optical LIBS sensor system is based on an optical emission technique using a high peak power pulsed laser beam to form a small spark (i.e., breakdown) directly in a process stream
  - The LIBS system is well suited for measurement of trace species at relatively high sampling rates. The system can sample at rates of 5 to 10 Hz and can detect many trace metals to between 10 and 200 parts-per-billion. This corresponds to single particles of roughly 100 to 250 nm primary particle size.
- Impact
  - Detect and monitor wear debris particles in engine exhaust environments for diagnostic and prognostic predictions
  - Elements that can be sensitively measured using LIBS include Al, Ba, Be, Ca, Cd, Cr, Cs, Fe, Mg, Mn, Na, Ni, Pb, Se, and V
- Current Program Status
  - Air Force Phase II SBIR, AF02-293, Arnold Engineering Development Center
  - Phase I completed April 2003
  - Phase II November 2003 - November 2005

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