Polymer-coated vertical-cavity surface-emitting laser diode vapor sensor

We report a new method for monitoring vapor concentration of volatile organic compounds using a vertical-cavity surface-emitting laser (VCSEL). The VCSEL is coated with a polymer thin film on the top distributed Bragg reflector (DBR). The analyte absorption is transduced to the electrical domain through modulation of the VCSEL output power as the polymer swell. We have investigated the responsivity of this technique experimentally using a plasma polymerized polystyrene coating and explain the results theoretically as a reflectance modulation of the top DBR.