Solid surface enhancement effects on chemiluminescence: Investigation of high performance solid media and its application to analytical chemistry

Yoshinaga T,1 Ichimura T,2 Hiratsuka H3
1. Dept of Applied Chemistry, Kyushu Institute of Technology, Sensuicho, Tobata, Fukuoka 804-8550, Japan
2. Dept of Chemistry, Tokyo Institute of Technology, Ookayama, Meguro-ku, Tokyo 152-8552, Japan
3. Dept of Chemistry, Gunma University, Tenjincho, Kiryu, Gunma 376-8515, Japan

Solid surface enhancement effects on chemiluminescence (CL) have been studied using many solid media, such as filters, organic polymers (synthetic and natural), inorganic materials (oxides and other compounds). We have found several interesting solid media which gave the following properties; (1) higher intensity and shorter lifetime, or (2) medium intensity and longer lifetime, compared with blank solid (glass plate) plus CL reagent. Recently, we have found some interesting characteristics of cationic species (alkaline metal ions, alkaline earth metal ions etc.) in solid media on chemiluminescence of diaryloxalate. Sodium ion gave the highest intensity among many cationic ions and the CL intensity further increased as the number of sodium ion increased. Organic compounds might also be good solid media if they contain sodium ions although they can be dissolved in some solvents. We applied these solid surface enhancement effects to the measurement of hydrogen peroxide (H2O2). A lowest detection limit of ca. 10^-8 mol was obtained using a detector which can detect photons of 10^-9 W (an Anritsu light power meter), whereas a detection limit of 5 x 10^-18 mol was obtained when we used a Lumicounter detector made by Microtech Nichion.