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A New Fluorescence Detection Method with Plastic Scintillators Using a Conventional LSC -Organic Waste Less Method

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Introduction; For tracer experiments in life science field, many types of compound are labeled with beta-emitters. The beta-emitters are generally measured using an liquid scintillation counter (LSC) because of their low energies. An LSC is a superior machine with high counting efficiency; however, there are mainly 2 demerits. Organic liquid wastes are generated after measurement because the sample is dissolved in liquid organic scintillator. And also a quenching of spectra always arises, so no one can identify what kind of nuclides exist in a sample. We developed a new fluorescence detection method with plastic scintillators, which are alternative material of liquid scintillator, using a conventional LSC without generation of organic liquid waste.
Methodology; Two kinds of plastic scintillator (PS) were prepared; a sheet type (BC-400; Saint Gobain USA) and a pellet type (EJ-200; G-tech Japan). The sheet was 0.5 mm in thickness and it was cut 55 mm in length (max. 75 mm) and 20 mm in width (max. 30 mm) for a 100 mL Teflon vial which inner diameter is 33 mm (Sanplatec Co. Japan) and it was used for nonvolatile compounds. The pellet was a 3 mm cylindrical shape and approximately 90 g of pellets were put in the Teflon vial, which were used for volatile compounds. An LSC used was LSC LB-7 (Hitachi, LTd. Japan). Radioactive materials used (Moravek Biochemicals Inc. USA) were 3H-methionine, 14C-arginine and 35S-methionine as nonvolatile compounds and tritiated water and 14C-acetic acid sodium salt as volatile compounds. Additionally, the surface of the PS-sheet was treated with dielectric barrier discharge plasma or fluorine gas treatment for tritium compounds measurement, because the surface was changed hydrophilicity and the contact area with the sample solution was extremely widened. Quantitative analysis and detection limits for using both of sheets and pellets were studied.
Results and discussion; The counting efficiency using the PS-sheets was same as that of liquid scintillator use, when the surface of PS-sheets were treated with plasma for tritium measurement. Though the PS-pellets showed higher counting efficiency compared with that of liquid scintillator when the sample solution was less than 500 μL, the counting efficiency was decreased depending on the sample solution increased. However, the detection limit became low with large sample solution.
Conclusion; Quantitative and qualitative analysis of beta-emitters were possible using plastic scintillators without generation of liquid organic waste. The PS-pellets and sheets could be used repeatedly after rinsing under hot running water. These PS-methods are low load and eco-friendly.

Country/Organization invited to participate

Japan

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