Application note

HIDEX 300 SL™

LUMINESCENCE ELIMINATION IN ^{14}C ASSAYS WITH TRIPLE COINCIDENCES

1. Introduction

Alkaline samples are sometimes encountered in LSC. An example are ^{14}C-monitoring assays at nuclear power plants where strongly alkaline samples are often produced from ion exchange resins.

A severe problem with alkalis is that they generate luminescence in many LS cocktails. In traditional two-PMT coincidence counters this can produce random coincidences (2-coincidences, duals), causing false unwanted signal.

Hidex 300 SL Liquid Scintillation Counter employs three PMT's and allows triple coincidences (3-coincidences, triples) as output. Unlike duals, random triples from luminescence are practically negligible. To demonstrate this, the following sample composition was studied:

3 ml of 2M NaOH + 17 ml of LS cocktail.

Two cocktails were compared: OptiPhase HiSafe 3 and Hionic Fluor, both from PerkinElmer. A ^{14}C sample (10000 DPM) and background were included. Counting was performed with 30 s repeats to record the typical luminescence decay. Window was wide (5-650) to cover the entire spectrum. Counting was started about two minutes from sample preparation.
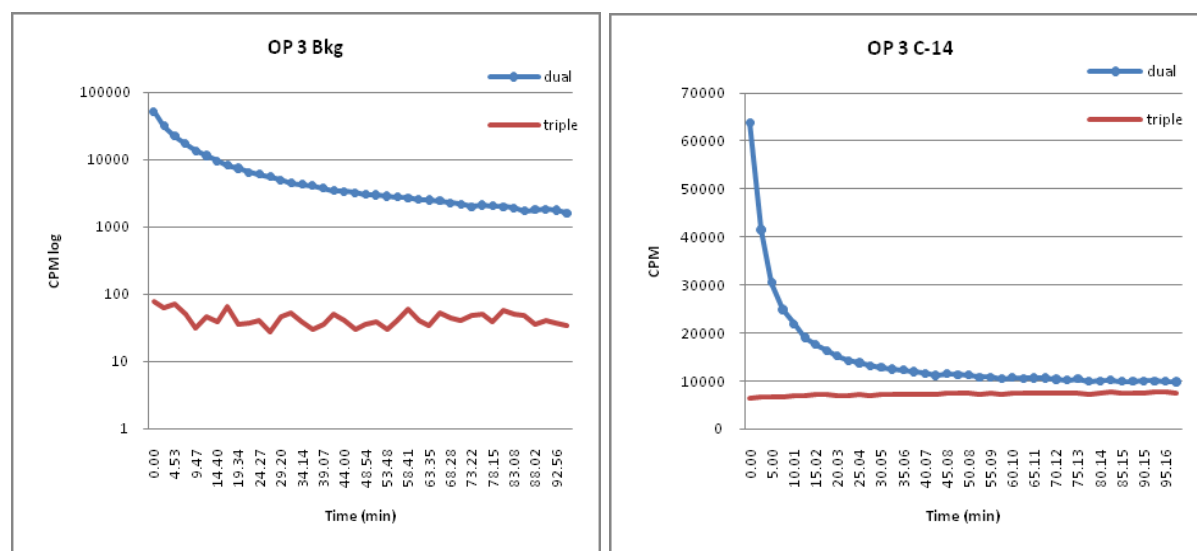
2. Results

Fig. 1. Luminescence decay in OptiPhase HiSafe 3 (OP 3). Left background (bkg), right ^{14}C of 10000 DPM. Note the logarithmic scale in bkg graph.
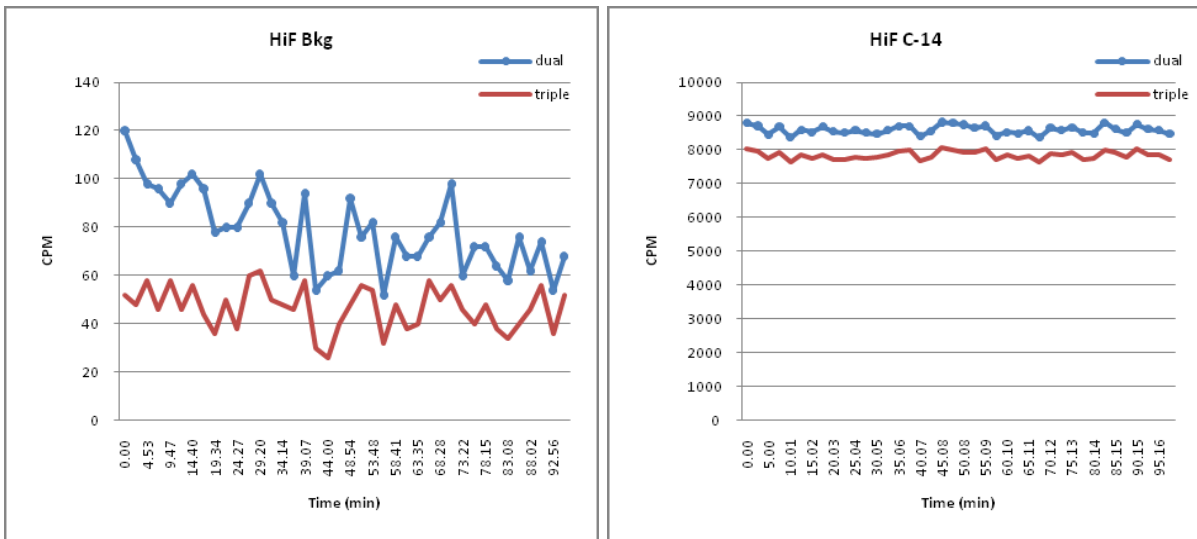
Application note

HIDEX 300 SL™

Fig. 2. Luminescence decay in Hionic Fluor (HiF). Left background (bkg), right ^{14}C of 10000 DPM.

3. Conclusions

Intense luminescence occurs in OptiPhase HiSafe 3, requiring tens of hours for duals to decay off. Instead, triples yield immediately a usable result.

Hionic Fluor produces much less luminescence. Still, it can be observed in the background sample of duals, requiring about one hour to decay. Again, triples are instantly free from luminescence interference.

4. Summary

Even strongly luminescent samples can be counted with 300 SL by utilizing triple coincidences as output, allowing immediate results. Thus it allows greater selection of cocktails.