



Benzene line: equipment, laboratory setup and staff training

Small Sample C14 Dating

Background. Huge number of C-14 dating samples, which are either relatively small or their material contains a low concentration of carbon dated with limited sample mass, which can be taken into operation. In both cases, the use of conventional radiocarbon dating for these samples result in small portions of benzene.

Issues. So we need to prepare the sample with benzene as high as possible coefficient of chemical yield, and then make the measurement of radiocarbon concentration in benzene sample with a possible minimum diluting the sample material.

Decisions. Application of [modern benzene line](#) allows you to work with samples, for which it is possible to synthesize 100-200 mg of benzene at high chemical yield, and on request this module for micro sample could be included into equipment set.

Application of hydrolysis module (See p. 4.2 of [specification](#)) which allows you to apply the capsule technology to produce lithium carbide.

Capsule technology is progressive by means of prepare few samples in the same process and what more it allows operate carbide sample some time later as each sample is hermetic and could be stored.

Application of anti-radon module decrease time of sample stabilization before counting which is most important for small samples of benzene.

Recent progress in development and application of Super Performances Teflon vials for Conventional Radiocarbon Dating.

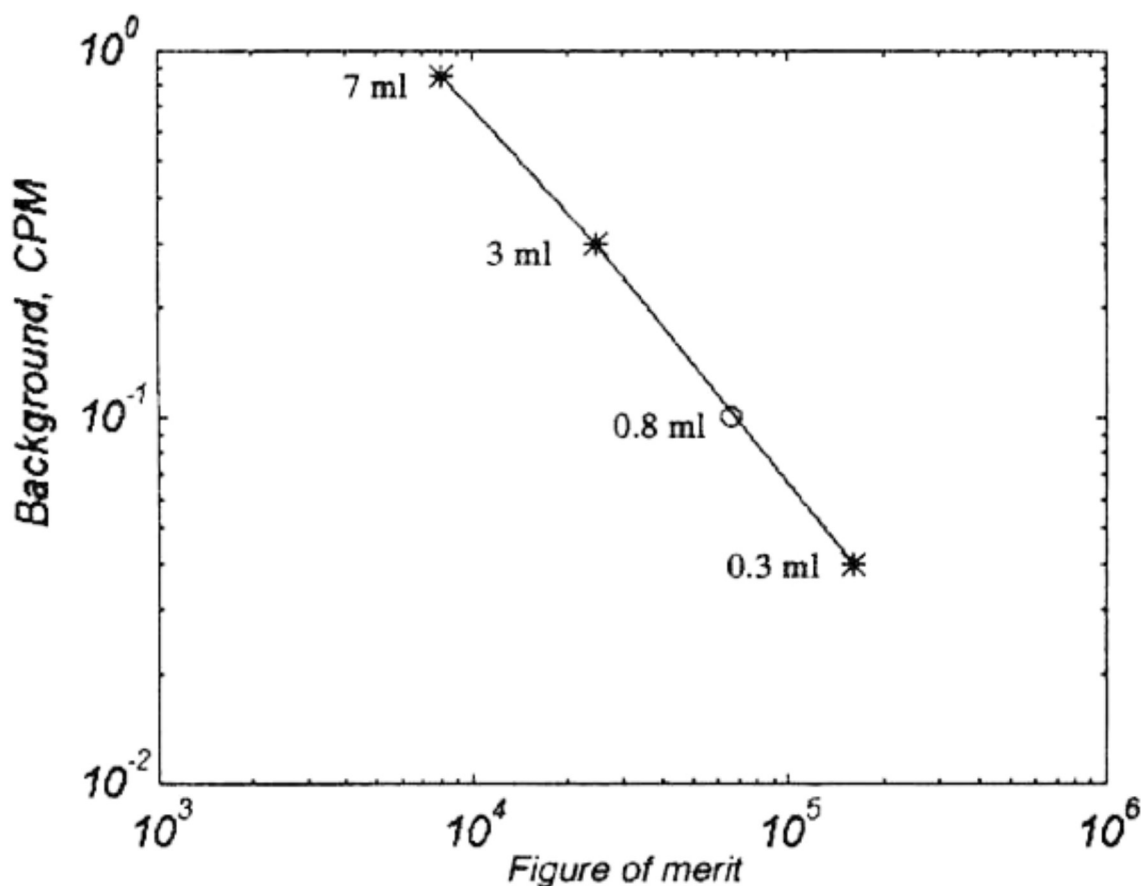
As it was stated ([Robert M Kalin and Austin Long, 1989](#)) traditional Teflon vials may have limitation, like they are time consuming in operation and may require individual calibration in series and they have benzene leakage limitation.

Special Glass vials ([A.G. HOGG, 1992](#)) will cover wide range of benzene volume measured (0.3 MI to 10 MI), when 10 MI vials are most applicable for precise measurement of radiocarbon and when 0.3 MI vials are suitable to provide accurate results with adequate precision for many applications, for samples containing 120-240 mg of carbon.

In addition it was shown that application of underground laboratory ([Wolfango Plastino and Lauri Kaihola, 2006](#)) can significantly decrease counting background.

Recent developments ([Michael Buzinny and Vadim Skripkin, 1995](#)) allow us to create of two parts 0.8 MI Teflon vial with different holder which have quite good performances described above. Now we offer most recently developed (Skripkin, unpublished) super performance (see photo above) Teflon vials which had got long durability, simple in use with different volumes: 0.8 ml, 1.5 ml, 2.5 ml, 4.0 ml 7.0 ml and have extreme Low benzene leakage.

Performances of Teflon vials, FOM vs Background



Producing benzene (small sample).

1. [Capsule technology](#) produces carbide high productively. It allow obtaining small benzene sample. It is well aplicable for both organic and carbonate samples. It is cheap and high effective. It allows simplification of all scheme obtaining of benzene because of highly pure carbide.
2. [Microliner thermodestruction technology](#) is a simple and highly productive for any kind of sample material.

References.

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3. Wolfgang Plastino and Lauri Kaihola . Liquid Scintillation Counting At Gran Sasso National Laboratory: radiocarbon measurements. LSC 2005, Advances in Liquid Scintillation Spectrometry. Edited by Stanislaw Chalupnik, Franz Schonhofer, John Noakes. pp 435-438.
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5. Vadim Skripkin, Mykhailo Buzynnyi. Teflon Vials for Precise C-14 In Benzene Measurements by LSC Technique. LSC-2017 - an International Conference on advance in Liquid Scintillation Spectrometry, 1-5 May, Copenhagen, Denmark. Book of abstract. p.72.
6. Vadim V Skripkin, Nikolai N Kovaliukh. Production Of Lithium Carbide From Very Small Organic And Carbonate Samples For Liquid Scintillation Radiocarbon Analysis. ZESZYTY NAUKOWE POLITECHNIKI SLASKIEJ - 1996. Seria: MATEMATYK A-FIZYKA z. 79. GEOCHRONOMETRIA 13. Nr kol. 1330