

Re-evaluation of ABA treatment for ^{14}C dating of charcoal from the Late Holocene layer

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Radiocarbon (^{14}C) dating has been used in field of geology and archaeology. Especially, in archaeology, high resolution and high accuracy dating is required. It had been suspected and had been tried to clarify the effect of the contamination by exterior organic matter on the ^{14}C date from the beginning of development of radiocarbon dating. There exists no research with the objective method for the effect of residual external organic carbon after pretreatment on the ^{14}C date. Thus, the discussion on what is reasonable and reliable sample in the ^{14}C dating method and the discussion on the most suitable chemical treatment condition are still left unsettled. Moreover, there exists no reliable chemical method to distinguish external organic matter and humified charcoal of sample charcoal. But we know empirically that charcoal's characteristics to resist against NaOH solution are different by burial and preserved states. Therefore, many researchers are using NaOH solution of low concentration when charcoal's characteristics to resist against NaOH are weak. The problem on the conventional ABA method is that what degree of concentration of NaOH solution is the most effective to the ^{14}C dating samples. There exists no consensus on the problem. Here, we require the adequate condition of sample and the adequate pretreatment condition to obtain reliable ^{14}C dates. However, as far as we know, there exist few data and researches on conditions of ABA pretreatment. In the present research, we try 5 steps pretreatment using alkaline solution increasing concentrations stepwise in order to search the optimum condition of alkaline treatment stage of ABA method. We make comparisons by the ^{14}C dates among residual charcoal of the individual pretreatment stages, and compare emission intensity of dissolved organic matter and absorbance of the extracted solutions of the individual pretreatment steps. Namely, the present research aims to clarify the problem of ABA method and its practical solutions. According to results of present research, we recommend 5 step-alkaline treatment by 5 concentrations (0.001, 0.01, 0.1, 1.0, 1.2 mol/L) of NaOH solution for charcoal treatment. This time, we discuss systematically about problems of the ^{14}C dating.

Keywords: Radiocarbon dating, Late Holocene, ABA method, Humic acid, 3D-Fluorescence spectroscopy