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Standard procedures for evaluing the oxygen vacancies and the crystallinity index in quartz: applications to provenance

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The number of oxygen vacancies, obtained by ESR (electron spin resonance) measurements, and the crystallinity index, obtained by X ray diffraction studies, have been found to be good proxies in estimating the origin of aeolian dust. The variations of origins of aeolian dust were investigated using these techniques to discuss the changes related to temporal changes in climate and monsoon by examining the loess sequence in Japan and the sediments in Japan Sea.

However, the methodology of these techniques has not yet been established. For example, gamma ray dose which is thought to be necessary to evaluate the number of oxgen vacancies by ESR, and scan speed and scan range vary depending on the researchers. In case of fine atomospheric deposition, it is very difficult to obtain pure quartz by chemical treatment. Therefore, the value is obtained by dividing the observed value by the quartz content, which is measured by X ray diffraction. It may be an issue to examine to test if the value varies depending on the quartz content. In the present study, we study the best measurement parameters for these techniques.

Keywords: ESR, crystallinity index, quartz, provenance