Preliminary study on the separation of diagenetic illite from the detrital minerals in sedimentary rocks

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As we know, dating sedimentary rocks has in part been hampered by the problem of completely separation of diagenetic illite from detrital minerals. In order to gain the better separation conditon we collected the clay minerals from the P-T boundary of Changxing, ZheJiang Province, China for this study.

The sample was first crushed to sand size in a jaw-crusher followed by gentle manual disaggregation in a mortar. The crushed particles were passed through a 300μm mesh to avoid overcrushing. The crushed clay powder was transferred to a large flask and dispersed in distilled water. All the samples were treated with EDTA to remove the carbonate and some samples also need to be treated with H_2O_2 to remove the organic matter. Temperature was kept below 50°C for all steps.The <2μm particles were obtained by applying Stoke's law. Then the <2μm particals were separated into four grain size fractions(2-0.5μm, 0.5-0.2μm, 0.2-0.1μm, <0.1μm) using high speed centrifuge. Finally, we use X-ray diffraction (XRD) and TEM to detect their purity and determine the better conditions. XRD shows that impurities, such as quartz, potassium-feldspar, albite, calcite and dolomite, decrease gradually with the decreasing grain size and there are no detectable impurities in the 0.1-0.2μm fraction. Especially, the content of mixing I/S in some grain size fractions is 100%. The K-Ar age of 249.9±3.8Ma and Ar-Ar age of 254.6-252.2Ma approach the age of the P-T boundary, which show that the separation is relatively successful. The 0.1-0.2μm fraction (corresponding speed of the centrifuge is 8000-10000 r/min, running 10 minutes) is suitable for K-Ar or Ar-Ar dating.

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LA-ICP-MS U-Pb zircon geochronology of the Yushulazi Formation in the North China Craton

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The Paleoproterozoic Jiao-Liao-Ji orogen in the North China Craton is composed mainly of the Liaohe Group (and its equivalents) and the Liaoji Granites, which are uncomformably overlain by a sedimentary succession, named Yushulazi Formation. The Yushulazi Formation has long been considered as a Proterozoic assemblage, but the age of the formation has never been precisely constrained in terms of modern geochronology. Cathodoluminescence images reveal that most detrital zircon grains from this formation are characterized by concentrically-oscillatory zoning, with comparatively low luminescence and high Th/U ratios, suggesting an igneous origin; whereas minor other grains have structureless overgrowth or recrystallization rims that are characterized by low Th/U ratio, indicating a metamorphic origin. The results of LA-ICP-MS U-Pb zircon analyses show that the detrital zircon grains have concordant U–Pb ages ranging from ca.1.05-1.3 1Ga and 1.87-2.51 Ga, with an inherited zircon core giving a concordant age of 3.35 Ga. The U-Pb age range of 1.87-2.51 Ga is in good accordance with that of the Paleoproterozoic Liaohe Group [1] and the basement rocks of the North China Craton. However, zircon ages of 1.05-1.31 Ga are, for the first time, reported for the Precambrian basement of the Eastern Block of the North China Craton. The recognition of the Mesoproterozoic zircons from the Yushulazi Formation indicate that (1) the Yushulazi Formation is not part of the Paleoproterozoic Liaohe Group, as some workers previously suggested; (2) and there existed local Grevillian-aged magmatism in the Eastern Block of the North China Craton, which may have been related to the assembly of the Meso-Neoproterozoic supercontinent Ronidia.

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Reference

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