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有机质对纳米级磁铁矿热稳定性的影响

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Effects of organic matter on thermal stability of nanometer-sized magnetite

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摘要 单畴磁铁矿颗粒是地质样品中最重要的磁性载体,其稳定性一直备受关注.为了认识有机质对纳米级磁铁矿颗粒热稳定性
文对比研究了趋磁细菌AMB-1合成的单畴磁铁矿分别在全细胞中和经去胞提纯后的纯化磁小体中的热磁性质,以及热处理后
参数和低温磁性的变化.发现仅有磁小体膜包裹的纯化磁小体中单畴磁铁矿热稳定性极强,而全细胞中的单畴磁铁矿加热过程
显著的热变化:磁铁矿在约270℃即开始转化,400℃以前几乎完全被有机质还原为顺磁性物质;同时在400℃以前,有机质的
有机质热分解引起磁小体链的坍塌,共同导致了样品矫顽力(B_c)、剩磁矫顽力(B_{cr})和剩磁比(M_{rs}/M_s)的减小,以及矫顽力比
增加. 我们的实验结果清楚地表明,当地质样品中含有较多有机质组分并受热事件影响时,其中的单畴磁铁矿难以得到保存.

关键词： 有机质 磁小体磁铁矿 热稳定性

Abstract： Single domain (SD) magnetite particles are significant magnetic carriers in geologic samples.
its stability remains a major concern due to their fine-grain sizes. To probe the effects of organic matter
thermal stability of magnetite nanoparticles, we comparatively studied the thermo-magnetic properties, l
parameters and low-temperature magnetic behaviors of isolated magnetosome magnetites of *Magnetospi*
magneticum AMB-1 and whole cell samples. The isolated SD magnetosome magentites with few amount
matter showed extremely good thermal stability, while the SD magnetites in whole cells changed strikingl
thermal treatment. The latter began to convert by ~270℃,and were almost entirely reduced to paramag
substance by 400℃. The coercivity (B_c), remanent coercivity (B_{cr}) and the ratio of saturation remanenc
saturation magnetization (M_{rs}/M_s) decreased, while the ratio of remanence coercivity to coercivity ($B_{cr}/$
increased when heating up to 400℃, owing to the reduction and decomposition of organic matter in who
Our results indicated that SD magnetite in geologic samples carrying substantial organic matter can be h
preserved if the samples were once heated to 300℃~400℃.

Keywords： Organic matter Magnetosome magnetite Thermal stability

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