Biotite - chlorite transformation during low temperature alteration

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Whole rock X-ray diffraction (XRD), microprobe analyses, back-scatter electron (BSE) imaging of biotite and chlorite were done in late Neoproterozoic volcanic rocks from different localities in Sinai, Egypt, to determine the transformation of biotite to chlorite during low temperature alteration. The magmatic brown and homogeneous biotite shows Al and Ti contents of 2.462-2.744 and 0.196-0.320, respectively. Green or brownish green biotite plates formed at the expense of pre-existing magmatic biotite display unusual composition. They are poor in Ti and K reaching maximally up to 0.152 and 0.779, respectively, and have an appreciable amounts of Al (3.420-4.151) approaching chlorite composition of Al= 3.111-4.692, Ti = 0.213-0.081 and K= 0.222-0.041. Such composition might be connected with increasing proportion of chlorite component in biotite at the early stages of its alteration. These changes in composition are accompanied by changes in mineral's crystallinity, which correlates with the tetrahedrally coordinated Al contents to be used for thermometric purposes.