



Mineralogical evolution during albitisation and scapolitisation of the Ødegården metagabbro, Bamble, South Norway

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A 25 km wide and 200 km long zone located on the west side of the Oslo Rift, extending from Modum in the north to Arendal in the south, is characterised by localised, but penetrative scapolitisation and albitisation. The Ødegården metagabbro, located in the Bamble sector, is pervasively scapolitised in a 1.5 km longzone of 50-100 m thickness, while albitisation occur locally restricted along zones of up to 1 metre thickness or along thinner fractures. The Ødegården metagabbro originated as a Proterozoic gabbro and is constituted by plagioclase + hastingsite + apatite + magnetite + ilmenite. The metagabbro underwent regional metamorphism with production of diopside on the expense of hastingsite. The regional metamorphism was followed by a pervasive transformation of plagioclase to Cl-rich scapolite (marialite), hastingsite to hornblende and ilmenite to rutile. The scapolitisation occurs as a gradual transformation of the metagabbro, resulting in the rock ødegårdite constituted by scapolite + hornblende + rutile + apatite ± diopside. A later bleaching of both the metagabbro and ødegårdite occurs in restricted zones. The bleaching occur as two different types: 1) Albitisation of metagabbro and ødegårdite along restricted zones up to one metre thickness. The plagioclase and scapolite transforms to albite, amphibole to a symplectite of amphibole + albite + serpentine and ilmenite to rutile. 2) Quartz + calcite-veins of up to two cm thickness causing a Na+Cl-metasomatism and carbonitisation penetrating < 20 cm into the wall-rock. Natrolite is crystallised on the vein wall, and the transformed host-rock is constituted by Cl-rich hastingsite + natronlite + calcite + quartz. The calcite occurs pervasively along grain boundaries and microcracks in the wall rock. Based on field evidences and mineralogical and petrographical evolution,

the scapolitisation is interpreted related to an early Cl-metasomatism of the metagabbro. The Cl-metasomatism is followed by a Na-metasomatism causing albitisation of both the metagabbro and the ødegårdite. Fluid infiltration along the quartz + calcite-veins causing Na+Cl-metasomatism and carbonitisation, is interpreted to represent a late stage in the geological evolution.