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Deep learning-based classification of mafic rocks using thin section images

HO SIM, YUNGOO SONG, SEONGSIK HONG, WONWOO JEONG AND MINWOO KO

Yonsei University

Presenting Author: simhone@yonsei.ac.kr

Recently, with the development of AI techniques, various attempts using machine learning have been made to classify rocks. Among the tools that can classify rock types, the most basic polarized microscope can observe both Plane Polarized Light (PPL) and Cross Polarized Light (XPL) images. In particular, rock-forming minerals contained in large amounts in igneous rocks can be distinguished through various characteristics on a polarized microscope image. Therefore, more detailed and objective classification of igneous rocks is possible through image analysis of machine learning. In this study, a new CNN model was developed to classify mafic volcanic and mafic plutonic rocks based on the previously developed image classification model. The target rock types are basaltic andesite, olivine basalt, trachytic olivine basalt, olivine tholeite, diorite, gabbro-norite, pyroxene-hornblende-gabbronorite, and troctolite. Each standard sample was trained on the CNN model by obtaining at least 100 PPL and XPL images. As a result of learning, it showed an accuracy of over 90% in most classifications. In the case of images whose classification was not accurate, most of the images were difficult for even a geologist to identify. Using this model, it is expected that even people without petrological knowledge will be able to classify rocks more accurately and quickly through polarized microscope images.