

Hole surface survey monitoring test using by rock magnetic analysis

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For a successful criminal conviction to occur, it is essential to locate forensically important evidences which are disposed in soil. In this study, we attempted rock magnetic method as a forensic search tool to detect evidences in soil. A 2.5 m long survey line was provided in the campus ground of Japan coast guard academy, 0.1 m×0.2 m×0.7 m sized hole was created and was buried into the sand soil. Magnetic susceptibility (MS) was measured using by a ZH instruments magnetometer every 0.1 m along the line, and was measured six times at every position. MS indicates relative higher values at the disturbed ground. A core sample in 7 cm length was collected using by a soil sampler at around the disturbed ground. The soil core was consisted of silty sand with granule, and the grain size of soil increases with burial depth. Dried soil samples were packed into 1 cm³ plastic cubes every 1 cm from the core. Rock magnetic measurements, MS, anhysteretic remanent magnetization (ARM), isothermal remanent magnetization (IRM) were conducted for the cube samples. The powder soil samples of isothermal magnetization (M_{rs}), saturation magnetization (M_s), coercivity (H_c), and remanence corecivity (H_{cr}) were measured. MS shows a peak at 2 cm in depth. Values of ARM and IRM gradually decrease with depth. It is implied that the relative high MS of disturbed ground was caused by the mixed lower soil. In order to identify magnetic minerals in the soil samples, thermomagnetic analysis (Js-T) was performed on four samples which are collected from the soil core of surface (0-0.2 m), middle (0.3-0.5 m) and deep parts (0.6-0.7 m) and the surface soil at the disturbed ground. All samples indicate declines of Js-T curves at 580°C and 680°C. A slight inflection in Js-T curves at around 300°C -400°C is also recognized, the presence of maghemite and hematite is thus suggested. M_{rs}/M_s and H_{cr}/H_c values of the core samples are plotted in the pseudo-single domain (PSD) region for (titano-) magnetite on the Day plot, and indicate that grain size of magnetic minerals downward decrease. The values of disturbed ground are located the central part of all samples which are implied that the mixed lower soils were contributed. The MS peak have been recognized after eight months although the disturbed ground covered by weeds and the hole is invisible. This result proves that MS can detect the location of disturbed ground over eight months post-disturbance. It is suggested that MS is effective for detecting the location of disturbed ground.

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