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A constitutive model for bonded geomaterials subject to mechanical and/or chemical degradation. (English) Zbl 1085.74507

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Summary: The mechanical behaviour of bonded geomaterials is described by means of an elastoplastic strain-hardening model. The internal variables, taking into account the ‘history’ of the material, depend on the plastic strains experienced and on a conveniently defined scalar measure of damage induced by weathering and/or chemical degradation.

For the sake of simplicity, it is assumed that only internal variables are affected by mechanical and chemical history of the material. Despite this simplifying assumption, it can be shown that many interesting phenomena exhibited by weathered bonded geomaterials can be successfully described. For instance, (i) the transition from brittle to ductile behaviour with increasing pressure of a calcarenite with collapsing internal structure, (ii) the complex behaviour of chalk and other calcareous materials in oedometric tests, (iii) the chemically induced variation of the stress and strain state of such kind of materials, are all phenomena that can be qualitatively reproduced. Several comparisons with experimental data show that the model can capture the observed behaviour also quantitatively.

MSC:

74L10 Soil and rock mechanics

74E40 Chemical structure in solid mechanics

Cited in 11 Documents

Keywords:

bonded geomaterials; mechanical destructureation; chemical degradation; plasticity; chemo-mechanical coupling

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