



CLASSIFICATION OF ROCKS ON THEIR CREEP BEHAVIOUR AT LOW STRESS LEVELS

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Abstract

In this study, it is aimed to classify rocks on their time-dependent properties. Bending creep tests on cantilever beam specimens are carried out at low stress levels. Four different rock types, namely Marble (Afyon), Marl (Tunçbilek - Kütahya), Sandstone (Beytepe - Ankara) and Tuff (Incehisar - Afyon) are used in these creep tests. Each rock type was tested four times at five stress levels, namely, at 10%, 20%, 30%, 40%, and 50% of their average instantaneous bending strengths. The test results are analyzed with the percent deformation criterion using ternary diagrams.

1. INTRODUCTION

The study of time-dependent deformation or creep in rocks is of great significance to mining engineering. The strength and deformation behavior of rocks are time-dependent [1]. Therefore, while designing structures in rock, time-dependent behaviour of rocks should be considered seriously. Time-dependent tests are useful not only in rock mechanics but also in structural geology. Creep tests are relevant in the design of underground openings, the study of failure mechanisms in rocks and in determining rheological properties of rocks. Creep studies were conducted under different stress systems. Most of the researchers have used the compression test, in particular uniaxial compression test [2]. Work in bending, torsion and direct shear were limited [3]. Research on the creep behavior of rocks was carried out by many investigators and reviewed by many others [4-8].

A classification based on time-dependent rock properties would be helpful in differentiating the rock which requires a comprehensive study with emphasis on the predominant property [9]. What is actually required from the classification is some indication as to whether, under a given stress system, the material remains intact, deforms a little and stops, or deforms continuously. Rock material behaves in neither of perfectly elastic nor plastic manner and it is necessary to determine which of these properties are prevalent [10-14]. In this study, four different rock types were tested in bending type creep tests at five stress levels, namely, at 10 %, 20 %, 30 %, 40 %, and 50% of their average instantaneous bending strengths. Each rock type was tested four times for each stress level.