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玻璃纤维增强聚合物锚杆承载特征现场试验

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摘要 锚杆支护方法在岩体加固工程中应用广泛，锚杆作为支护结构的核心应具有足够的安全度和耐久性。由于钢材易腐蚀，钢锚杆的耐久性受到质疑。玻璃纤维增强聚合物锚杆是一种由树脂和玻璃纤维复合而成的新型加固材料，具有较好的力学性能和耐腐蚀性能，用其代替传统钢筋用于边坡加固可以较好地解决锚杆耐久性问题。现场试验采用千斤顶施加拉拔荷载，用锚杆应力计和分布式光纤BOTDR技术测量锚杆应力，研究不同荷载条件下玻璃纤维增强聚合物锚杆的承载力特征及分布规律，为玻璃纤维增强聚合物锚杆用于永久加固工程的可行性研究提供基础资料。

关键词 岩石力学 边坡工程 玻璃纤维增强聚合物锚杆 拉拔试验 BOTDR技术

分类号

FIELD TEST ON LOAD-BEARING CHARACTER OF GLASS FIBER REINFORCED POLYMER BOLT

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Abstract

Rock bolting is a support method widely used in slope engineering，tunnel and large cave support，as well as reinforcement of building structure. As the main part of the support structure，the bolt must have enough reliability and durability. However，steel is easily eroded by the environment，so the durability of commonly used steel bolt should be paid more attention to. The glass fiber reinforced polymer(GFRP) bolt，which has better mechanical properties and corrosion resistances is a new kind of reinforcement material compounded with resin and glass fiber. The durability problem in slope engineering can be solved if the GFRP bolt takes the place of steel bars. The bolt stressometer and BOTDR monitoring technique are introduced；and the relationship between stress and strain of the GFRP bolt under cyclic tensile load is studied. The test result shows that BOTDR technique is a feasible method；and the monitoring effect is reliable. The stress of the GFRP bolt increases with the load increasing and decreases with the depth of the anchor increasing. The stress depth curve of the GFRP bolt agrees with regular hyperbolic pattern in the superficial part. With the length increasing，the distribution curve of the GFRP bolt transits in a lineal pattern. The stress transfer depth of the GFRP bolt increases with the cyclic tensile load and cyclic times；and the maximum stress depth of the GFRP bolt is less than 1.70 m under the test condition. The field test is undamaged one，and the maximum load of the test is 100 kN and does not reach the failure load of the GFRP bolt. So the damage course of the GFRP bolt must be further studied.

Key words rock mechanics slope engineering glass fiber reinforced polymer(GFRP) bolt pull-out test BOTDR technique

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