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论文

适于弱胶结软岩的新型冻结孔封孔材料性能及微结构研究

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摘要：

我国西部地区的弱胶结软岩，岩石强度低，遇水泥化，当采用全深冻结时，冻结壁解冻后时常出现下部冻结管串水，导致工作面涌水和淹井的安全事故。针对这些问题，本文研究适于这种地层的新型冻结孔封孔材料的工作性、强度以及受冻后的抗渗性，并从受冻后的材料的孔结构和SEM形貌来探讨其机理。结果表明：新型冻结孔封孔材料具有很好的流动性，且流动度损失小，浆体的保水性好，无泌水；其3，28 d的抗折、抗压强度都明显高于普通水泥浆，且经受-30 ℃的低温受冻28 d后的强度损失小；新型冻结孔封孔材料受冻后，开始出现渗水的水压以及渗水范围扩大时的水压要比普通水泥浆封孔材料提高1~2 MPa。微观试验表明：新型封孔材料与普通水泥浆封孔材料相比，总孔隙面积降低、中值孔径减小、孔隙率降低，容重和表观密度增加，混凝土结构密实。

关键词： 冻结孔；封孔材料；抗渗性；微结构

Study on performance and microstructure of new type sealing material suitable for freezing hole at weakly cemented soft rock

Abstract:

The weakly cemented soft rock in the western region of China has low strength and argillization.With a full deep freezing，at the lower part of the pipe，it often appears water coming from the top part of the pipe when the hole wall thaws，which is likely to result in hazards like gushing water in work place and flooding.Therefore，this study will investigate the material for new type freezing hole’s sealing in terms of its workability，strength and impermeability after it is frozen in this type of stratum.The study looks into its mechanism from the aspects of pore structure after frozen and SEM morphology.The results indicate that new type freezing hole’s sealing material has good fluidity，and low fluidity loss.Also，the new slurry is good in water retention，and no water separation，and after 3 days and 28 days，its flexural and compressive strength are obviously higher than that of ordinary cement slurry.Furthermore，withstanding -30 ℃ low temperature test for 28 days，its strength loss is small.After the new type freezing hole’s sealing material is frozen，at the time of starting seepage and expanding the scope of seepage，the pressure of the seepage water is 1-2 MPa higher than that of ordinary cement slurry sealing material.In addition，the microstructure tests show that，compared with ordinary cement slurry sealing material，the new type of sealing material has several advantages such as the reductions of total pore area，median pore，and porosity，while with the bulk density and apparent density increasing，and the concrete structure becomes compact.

Keywords: freezing hole；sealing materials；impermeability；microstructure

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