

页岩水力压裂物理模拟与裂缝表征方法研究

郭印同¹, 杨春和¹, 贾长贵², 徐敬宾¹, 王磊¹, 李丹^{3*}

(1. 中国科学院武汉岩土力学研究所 岩土力学与工程国家重点实验室, 湖北 武汉 430071; 2. 中国石油化工股份有限公司技术研究院 北京 100101; 3. 武汉科技大学 城市建设学院, 湖北 武汉 430065)

RESEARCH ON HYDRAULIC FRACTURING PHYSICAL SIMULATION AND FRACTURE CHARACTERIZATION METHODS

GUO Yintong¹, YANG Chunhe¹, JIA Changgui², XU Jingbin¹, WANG Lei¹, LI Dan^{3*}

(1. State Key Laboratory of Geomechanics and Geotechnical Engineering, Institute of Rock and Soil Mech Chinese Academy of Sciences, Wuhan, Hubei 430071, China; 2. Sinopec Research Institute of Petroleum College of Urban Construction, Wuhan University of Science and Technology, Wuhan, Hubei 430065, Chi

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摘要 采用真三轴岩土工程模型试验机、压裂泵伺服控制系统、Disp声发射三维空间定位技术、试验前后工业CT扫描水力压裂形态的方法, 建立一套页岩水力压裂物理模拟与压裂缝表征方法。由页岩水力压裂物理模拟试验可得: (1) 采用Disp声发射三维空间定位监测方法, 能实时有效地监测水力压裂缝的起裂位置; (2) 采用水力压裂后追踪红色示踪剂痕迹的方式, 可实现缝的空间形态描述; (3) 当水力压裂未形成沿天然层理面的贯通压裂缝时, 易形成与天然层理面相交的压裂缝, 并与层理面又形成网络裂缝。建立的页岩水力压裂物理模拟试验与表征方法, 可进行页岩压裂施工参数的优化设计, 为页岩气储层水力提供技术支持。

关键词: 岩石力学 页岩 水力压裂 物理模拟 裂缝描述 声发射定位

Abstract: In order to study the hydraulic fracture and crack shape, the large real triaxial simulation experimental system, servo control system of hydraulic fracturing equipment, Disp acoustic emission(AE) dimensional orientation technique and CT scanning technique are applied; and the hydraulic fracturing ph simulation testing method and the characterization methods of hydraulic fracture have been established. According to the test, some conclusions are drawn as follows. (1) Using 8 transducers acoustic emission sources orientation technique, starting-crack pressure and the direction of hydraulic fracture can be mor continuously. (2) Adding a red tracer into fracturing fluid and parting the sample can describe the spatial morphology of the hydraulic fracturing. (3) When the hydraulically created fracture extended is not along natural bedding plane, it can easy to form the network crack. The physical simulation and characterizatic methods of hydraulic fracturing can be used for optimization design, so as to provide technical service fo gas exploiting.

Keywords: rock mechanics shale hydraulic fracturing physical simulation fracture characterization acoustic emission location

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