

研究报告

脉冲中子全能谱测井数据处理方法及影响因素的模拟研究

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摘要 C/O能谱测井是确定含油饱和度的主要测井方法, 模拟水平井条件下的非弹性散射伽马能谱, 研究C/O值与含水饱和度、孔隙度及泥浆侵入深度的关系。而探测器的类型、尺寸、探测效率、能量分辨率、稳谱、能谱的处理方法以及中子对探测器晶体的作用都会对测井结果产生影响。利用蒙特卡罗方法模拟源距分别为30cm和58cm处, 且井眼和地层流体分别为油和水砂岩地层的中子能量分布, 通过研究中子对NaI、BGO、GSO和LSO四种探测器的作用及响应关系得到: 中子对探测器的作用将使地层流体分辨能力降低。模拟改变NaI和BGO晶体探测器的直径和长度时的探测器响应能谱, 采用不同的能窗处理方法对地层流体的分辨能力不同, 选取光电峰和第一、第二逃逸峰对应的能量窗时BGO晶体探测器测量的C/O差值要比NaI晶体探测器的大, 但受尺寸的影响不大; 但采用光电峰对应的能量窗时, BGO晶体探测器测量的C/O差值要比NaI大得多, 且随着尺寸的增加差值也增加。能量道的漂移对C/O值影响较大, 而能量分辨率对差值影响相对较小

关键词 [随钻](#) [碳氧比能谱](#) [探测器晶体](#) [中子](#) [响应](#) [蒙特卡罗模拟](#)

分类号

Monte Carlo Simulation for the Detector of C/O Ratio Spectroscopy Logging

Abstract C/O Logging is a main logging method that can determine oil saturation, the relationship between C/O values and water saturation, porosity and mud invasion depth was studied by simulating non-elastic scattering gamma spectroscopy under the conditions of horizontal wells. But the type, size, detection efficiency and energy resolution of the detector, and stability and processing method of gamma-ray spectrum will influence the logging data. In addition, the reaction of detector crystal induced by the neutron can change the result. The neutron energy distribution of the oil and water sandstone formation was simulated by using Monte Carlo method, under the condition of different spacing and borehole and formation fluid. It is concluded that the reaction on detector induced by neutron will reduce the distinguish ability to formation fluid according to researching the neutron response of NaI, BGO, LSO and GSO detector. The ability is different when different energy window was selected to distinguish formation by simulating the detector response spectrum of various diameters and length of NaI and BGO crystal. The C/O difference of BGO crystal is higher than NaI crystal when the energy window includes photoelectric peak, the first and the second escape peaks, but it is less affected by the different size of detector crystal. But using photoelectric peak corresponding to the energy window, the C/O difference of BGO crystal detector is much larger than NaI, but also it is increasing with the size of crystal increasing. The C/O value is greatly affected by energy drifting, while relatively a little by energy resolution.

Key words [LWD](#) [C/O ratio spectrum](#) [Detector](#) [Neutron](#) [Response](#) [Monte Carlo Simulation](#)

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