中国电机工程学报 2011, 31(4) 125-129 DOI: ISSN: 0258-8013 CN: 11-2107/TM

高电压技术

旋转电弧开关及其电弧运动速度特性

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摘要：

为满足脉冲功率技术对闭合开关高电压、大电流、高电荷转移量、电极烧蚀小、寿命长的要求，设计了一种轴向磁场控制的旋转电弧开关。利用有限元软件分析开关间隙中驱弧磁场的位形及大小，得到间隙中磁感应强度与开关结构参数及电流大小的关系。采用B-dot探针测量电弧的旋转速度。实验电源为时序放电回路，在开关上得到近似梯形状的电流波形，实验中电流为18~72 kA，磁感应强度为0.104~ 0.628 T。通过改变上下线圈的匝数，得到在不同驱弧磁场下电弧的运动速度，并与其他旋转电弧开关的运动速度进行比较。对实验数据进行拟合，可知电弧运动速度与间隙中的轴向磁感应强度大小成指数关系。该关系表明，所设计的开关中，电弧运动速度可以由间隙中的驱弧磁场惟一确定，这与外部磁场驱弧方式相比有很大的区别。

关键词： 旋转电弧开关 轴向磁场 B-dot探针 电弧运动速度

A Rotating Arc Gap Switch and its Arc Velocity Characteristics

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Abstract:

A rotating arc gap switch controlled by axial magnetic field was designed and built to meet the needs of high voltage, high current, large charge transfers, slight electrode erosion and long lifetime. The magnetic field distribution in the gap was analyzed by ANSYS. The relationship between magnetic flux density in the gap and switch geometry and arc current was obtained. B-dot probes were employed to measure the arc rotating velocity. The current was trapezoid-like waveform and generated by a time-sequence discharge power supply. The current was in the range of 18~72 kA and magnetic flux density was 0.104~0.628 T. The arc velocity in different magnitude of magnetic flux density was obtained by changing the coil number and the results were compared with other rotating arc gap switches. The arc velocity has exponent relation to the axial magnetic field by fitting the experimental data. The results show that the arc velocity in this kind of switch is individually determined by axial magnetic field. It is significant different from other rotating arc devices which provide an external magnetic field.

Keywords: rotating arc gap (RAG) switch axial magnetic field B-dot probe arc rotating velocity

收稿日期 2010-02-23 修回日期 2010-07-10 网络版发布日期 2011-02-12

DOI:

基金项目:

国家自然科学基金项目(50437020)。

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参考文献：

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1. 王清玲 郭良福 何孟兵 潘垣.轴向磁场控制的旋转电弧开关的研制[J]. 中国电机工程学报, 2006,26(3): 102-105