



## 论文摘要

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### 多频激电相对相位的物理模拟

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**摘要:** 用激电法来区分矿与非矿异常的研究分为两类: 一类是研究激电场的时间特性或频率特性, 另一类是研究激电场的非线性电效应. 对三维地电结构的激电场研究, 使用积分方程法比较合适. 作者从电磁场基本理论出发, 研究了三维电磁场在均匀导电半空间的张量格林函数, 推导出该函数不含广义索末菲积分的解析式, 其分量用初等函数和修正贝塞尔函数的有限形式表示, 可以解决均匀半空间张量格林函数的快速计算问题. 基于此函数求解 Fredholm 方法, 将异常体剖分为一系列小立方体单元, 并把此方程转化成矩阵方法便可计算出空间任意一点的电势. 此外, 利用中梯装置对金属硫化物矿和石墨开展了相对相位的模拟计算, 其结果与物理模拟成果对比, 证明计算方法是正确的. 该方法利用三个相对相位差, 可以快速评价异常源的性质, 进而达到区分激电异常的目的.

**关键字:** 张量格林函数; 积分方程; 多频激电; 相对相位

### Physical analogy of relative phase in multi-frequency induced polarization

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**Abstract:** There are two methods to discriminate the properties of mine with induced polarization. One is to research into the time or frequency principles of IP, the other is non-linearity of IP. Usually it is better to compute three-dimensional geological body by integral equation. Started from electromagnetic basic theory, analytical expression of tensor Green's function of homogeneous half-space in three-dimensional EM field is expounded. The Fredholm equation is solved using tensor Green's function. The anomalous body is divided into a number of cubic cells and the integral equation is reduced to a matrix equation. Then the electric and magnetic field at any point in the earth can be calculated. Compared with the physical modeled result, relative phase survey of pyrite and graphite is simulated, which verifies the computational method.

**Key words:** tensor Green's function; integral equation; multi-frequency induced polarization; relative phase

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