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论文

铜、镍、铂族元素地球化学性质及其在幔源岩浆起源、演化和岩浆硫化物矿床研究中的意义

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摘要:

Ni、Cu和PGE具有不同于其他微量元素的特殊的地球化学性质,这些特殊的性质使得它们在幔源岩浆起源和演化以及岩浆硫化物矿床的成因研究中具有不可替代的作用。在S不饱和的条件下,Ni、Os、Ir和Ru具有相容元素的特性,而Cu和Pd是强不相容元素,因此,它们在玄武岩浆分离结晶过程中常常发生分异。一旦体系达到S饱和,这些元素则会强烈地进入硫化物熔浆,特别是PGE具有极高的硫化物熔浆/硅酸盐熔浆分配系数,极微量的硫化物熔离便可导致残余岩浆中PGE的显著亏损,因此,PGE是玄武岩浆硫化物熔离作用最敏感的示踪元素。硫化物熔离和成矿实质上是幔源岩浆特殊演化过程的结果,所以,Ni,Cu和PGE的特殊性质可用来探讨岩浆硫化物成矿的关键控制因素。Ni、Cu和PGE具有不同的单硫化物固溶体/硫化物熔浆分配系数,因此,它们也是硫化物熔浆结晶分异的重要示踪元素。本文试图从Ni、Cu和PGE地球化学性质和行为入手,并借助一些研究实例,对它们在幔源岩浆起源和演化以及岩浆硫化物矿床成因研究中的示踪意义进行系统介绍。

关键词: 关键词：PGE;幔源岩浆;玄武岩;岩浆硫化物矿床;岩浆起源;岩浆演化;硫化物熔离

Geochemical natures of copper, nickel and PGE and their significance for the study of origin and evolution of mantle derived magmas and magmatic sulfide deposits.

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Abstract:

Ni, Cu and PGE are very important in the study of origin and evolution of mantle derived magmas and the formation of the related magmatic sulfide deposits, because their geochemical natures are different from other trace elements. Ni, Os, Ir and Ru are compatible elements, and Cu and Pd are incompatible in sulfur under saturated magmas. Thus, they may be differentiated during fractional crystallization of the sulfur under saturated basaltic magma. In contrast, all of these metals will be concentrated in sulfide liquid while sulfur saturation is reached. Particularly, minor sulfide removal will result in PGE depletion in the basaltic magma because PGE have very high sulfide liquid/silicate melt partition coefficients. Therefore, PGE are the most sensitive tracers for sulfide segregation. Ni, Cu and PGE are also very important in the studies of key factors of the formation of magmatic sulfide deposits, which resulted from the evolution of mantle derived magmas. They are also significant for revealing fractionation of sulfide melts because Ni, Cu and PGE have different sulfide solid solution/sulfide liquid partition coefficients. In this article, the significances of Ni, Cu and PGE in the studies of origin and evolution of mantle derived magmas and the formation of magmatic sulfide deposits are presented systemically, based on the introduction of natures of these elements.

Keywords:

Key words: PGE; mantle derived magma; basalt; magmatic sulfide deposit; origin of magma; magma evolution; sulfide segregation

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