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MİNERAL KİMYASI DERSİ ÖDEVİ

1. **GİRİŞ:** Konunuzu oluşturmak üzere belirlenen mineral grubunun genel kristalografik, optik ve fiziksel özellikleri özetlenecek.

2. **GENEL MİNERAL KİMYASI:** mineral grubunun genel kimyasal bileşimi, sınıflaması, uç üyelerinin neler oldukları, isimleri, uç üyelerin kimyasal bileşimleri, ve bunların hangi kritere göre ve nasıl sınıflandıkları anlatılacak. Eğer varsa, solid solution ve dissolution gibi özellikleri ve bunların nedenleri tartışılacak.

3. **MİNERAL YAPISI (STRUCTURE)**
   - 3.1. Seçilmiş olan mineral grubunun silikat iç yapısı,
   - 3.2. Yapısındaki bağların nitelikleri,
   - 3.3. Yapıda iyonların yer alabileceği yerlerin (site) boyutu, koordinasyon sayısı ve bu yerlerde hangi elementlerin iyonlarının yer alabileceği,
   - 3.4. Ortam koşulları ile site'ların boyutları ve bu site'larda yer alabilecek elementlerin türü arasındaki bağıntılar.

4. **UYGULAMA: VERİ ANALİZİ VE YORUMLAMA**

Sizlere verdiğim diskette kendi adınızı taşıyan bir *Microsoft Excel 97* dosyası bulacaksınız. Bu dosyada 8-10 volkanik kayaç numunesine ait tüm kaya (whole-rock) majör, iz ve Nadir Toprak Element (Rare Earth Elements: REE) analizleri vardır. Ayrıca bu numunelerin içerdiği minerallere ait Elektron Prob (25-30 nokta analizi) sonuçları da bulunmaktadır. Elektron prob sonuçları, majör elementlerden oluşmaktadır. Elektron prob veri tabanında ayrıca her bir elementin formüldeki oranları da hesaplanarak verilmiştir. Elektron prob sonuçlarına ek olarak minerallerden birkaçının ICP-MS ile analiz edilmiş REE ve iz element sonuçları da veri tabanı içinde sizlere verilmektedir.

Veri tabanına ek olarak, üzerinde çalışacağınız kayaçların makro numuneleri ve ince kesitleri de bulunmaktadır. İstediğiniz zaman başvurarak bu kesitlerin petrografik incelemesini yapabilirsiniz.

Uygulamada yapılması istenenler:

Veri tabanındaki verileri kulanarak aşağıdaki işlemleri yürütünüz:

- 4.1. SINIFLAMA ve UÇ-ÜYELERİN (END MEMBERS) BULUNMASI**:** Veri tabanında verilmiş olan mineral analiz sonuçlarını kullanarak, minerallerinizin her birinin ayrı ayrı uç üyelerini hesaplayın ve grafik yolla sunumunu yapın. Her bir nokta analizine ait fenokristalin kimyasal adlamasını grafikler üzerinde belirtin. Uç

üye bileşimlerini tabloya çevirin ve grafikleriyle birlikte ödevinize şekil halinde ekleyin.

Piroksen ve amfibol minerallerinin uç üyelerini hesaplamak için gerekli **clasamph.exe** ve NEWAMPHCAL programları sizlere verdiğim disketler üzerinde bulunmaktadır. Plajioklaslar için ise özel bir programa gerek yoktur.

Verilerinizin üçgen diyagram üzerinde grafik sunumunu yapmak için **TriDraw**, **Triangle** veya **Newpet** gibi programları kullanabilirsiniz. Benim size tavsiyem ***Newpet*** programı olacaktır. Programlar bende bulunmakta olup, gerektiğinde alabilirsiniz.

4.2. JEOTERMOMETRE VE BAROMETRE HESAPLAMALARI: ekte verilen kaynak listesini inceleyin konunuz olan mineralin jeotermometre ve barometresi ile ilgili kaynakları tespit edin. Bu kaynakları benden sağlayabilirsiniz. Kaynaklarda anlatılan yöntemlere göre minerallerinizin kimyasal bileşimlerinden kristallenme sıcaklık ve basıncını her bir nokta numune için ayrı ayrı hesaplayın. Hesaplamalarda Excel'i kullanmanızı tavsiye ederim. Elde ettiğiniz sonuçları tablo halinde ödevinize ekleyin.

Önerdiğim sistematikler:

Amfibol için: Schmidt'in (1992) Al-in-hornblend jeobarometresi, Blundy & Holland'ın (1990) amfibol-plajioklas termometresi.

Piroksen için: Lindsley & Andersen'ın (1983) the two-pyroxene termometresi.

Plajioklas için: Kudo & Weill'in (1970) plajioklas termometresi ve Seck'in (1971) two feldspar termometresi.

4.3. "Amfibol konusunda ödev hazırlayacak arkadaşınız, kristallenme basıncına göre, mineralin içinde oluştuğu *magma odasının derinliğini* hesaplamalıdır". Sonuçları tablo halinde ödevinizde sunmanız gerekmektedir.

4.4. MİNERAL / MAGMA ERGİYİĞİ DAĞILIM KATSAYILARI (K_d): eldeki mineral ve tüm kaya majör, iz ve REE veri tabanını kullanarak mineral numunelerinizin her element için ayrı ayrı mineral / magma dağılım katsayılarını (partition coefficient) hesaplayın. Elde ettiğiniz sonuçları tablo şeklinde ödevinize ekleyin.

5. K_d **DERLEMESİ (COMPILATION):** konunuzu oluşturan mineral grubu için ekte verdiğim referans listesinden yararlanarak ve size aşağıda bir liste şeklinde önerdiğim kaynaklardaki verileri kullanarak, referanslarda verilen tüm elementleri içeren kapsayan bir

veri tabanı oluşturun. Bu veri tabanına kendi hesapladığınız K_d değerlerini de girin. Ayrıca her numunenin ana kayasının SiO_2 wt.% değerini de veri tabanınıza girin.

Amfibol K_d derlemesi için kullanılmasını önerdiğim kaynaklar:

Adam et al. (1993)
Compilation of Cox et al. (1979)
Compilation of Gill (1981)
Compilation of Henderson (1982)
Compilation of Pearce & Norry (1979)
Dostal et al. (1983)
Fujimaki et al. (1984)
Lemarchand et al. (1987)
Nagasawa & Schnetzler (1971)
Nicholls & Harris (1980)
Schnetzler & Philpotts (1968)

Klino piroksen K_d derlemesi için kullanılmasını önerdiğim kaynaklar:

Compilation of Cox et al. (1979)
Compilation of Gill (1981)
Compilation of Henderson (1982)
Compilation of Pearce & Norry (1979)
Harth & Dunn (1993)
Kuehner et al. (1989)
Mahood & Stimac (1990)
Schnetzler & Philpotts (1970)
Schock (1977)
Sisson (1991)

Plajioklas K_d derlemesi için kullanılmasını önerdiğim kaynaklar:

Compilation of Cox et al. (1979)
Compilation of Henderson (1982)
Dostal et al. (1983)
Lemarchant et al. (1987)
Nagasawa (1973)
Nash & Crecraft (1985)
Philpotts & Schnetzler (1970)
Romick et al. (1992)
Sun et al. (1974)

Bu kaynaklar dışında üniversitemiz web ana sayfasında genel duyurular sayfasına linkli ISI Science Citation Index veritabanından yararlanarak daha güncel kaynaklara da ulaşabilir ve bunlardan da yararlanabilirsiniz.

6. **K_d DEĞERLENDİRMESİ:** oluşturduğunuz veri tabanında her elemente ait K_d değerlerini numunelerin ana kayaçlarının SiO_2 wt. % değerine karşı (SiO_2 X ekseninde olacak, K_d'ler Y ekseninde olacak ve eksen de logaritmik olacak şekilde) iz düşün. Arada belirli bir ilişki olup olmadığını araştırın. K_d ile SiO_2 arasındaki ilişkiyi en iyi yansıtacak best-fit line'ı (regression line) diyagram üzerine hesaplatarak iz düşün. Regresyon istatistiği ile ilgili ek bilgi için bana başvurabilirsiniz. Bu işlem için sizlere Microsoft Excel'i önermekteyim. Bu regresyon çizgisinden yararlanarak, bazik (SiO_2 = 50), ortaç (SiO_2 = 60) ve asit (SiO_2 = 70) magmalar için önerebileceğiniz optimum K_d değerlerini belirleyin. Önerdiğiniz değerleri bir tablo haline getirin ve ödevinize ekleyin.

7. **YORUM:** mineral kimyası uygulamasında yaptığınız çalışmada elde ettiğiniz sonuçların potansiyel kullanım alanının, gerek petroloji ve jeokimya çalışmalarında ve gerekse jeolojinin diğer disiplinlerinde ne olabileceğini ve önemini tartışın.

Başarılar dilerim…
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