



Dokuz Eylül Üniversitesi
İnşaat Mühendisliği Bölümü



İNŞ2024 YAPI MALZEMESİ II

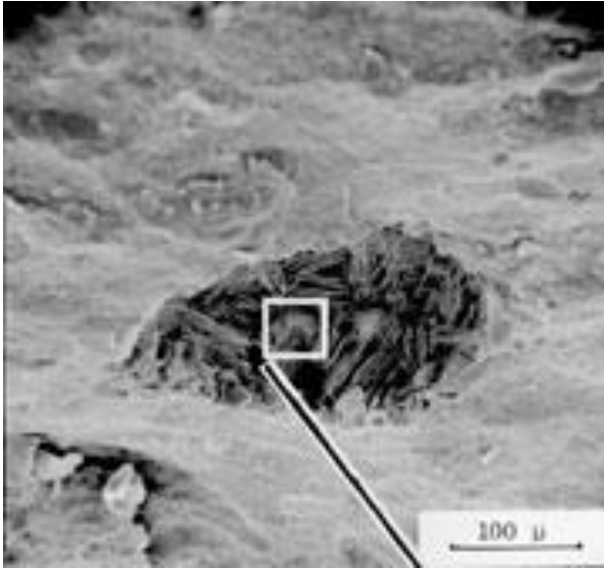
BETONUN İÇ YAPISI

Prof. Dr. Halit YAZICI

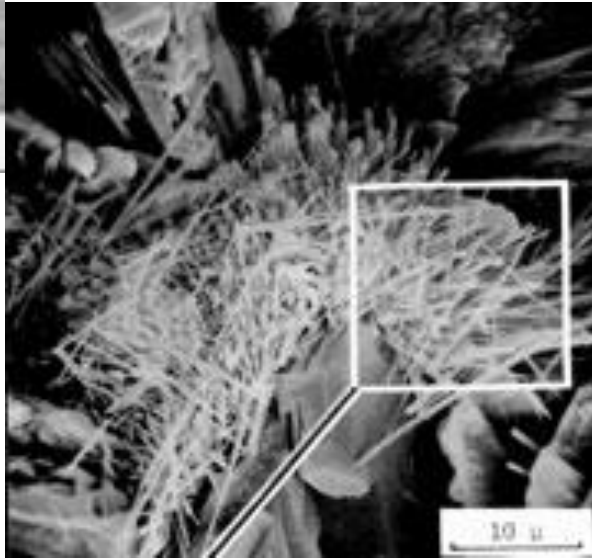
<http://halityazici-deu.com>



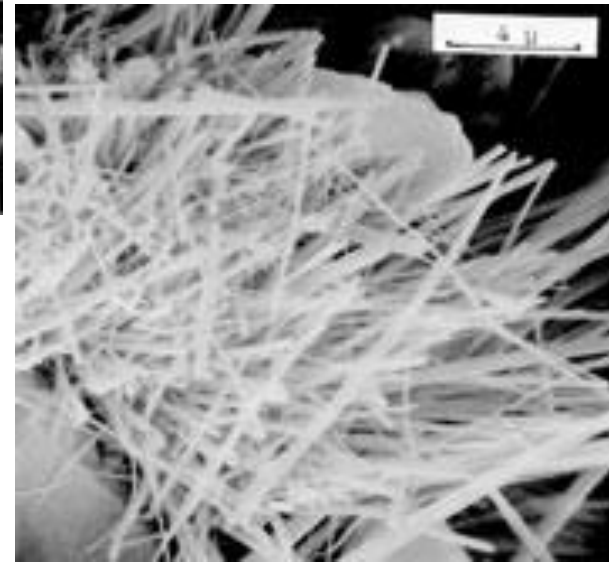
Makroskobik ölçekte beton kesiti



200X

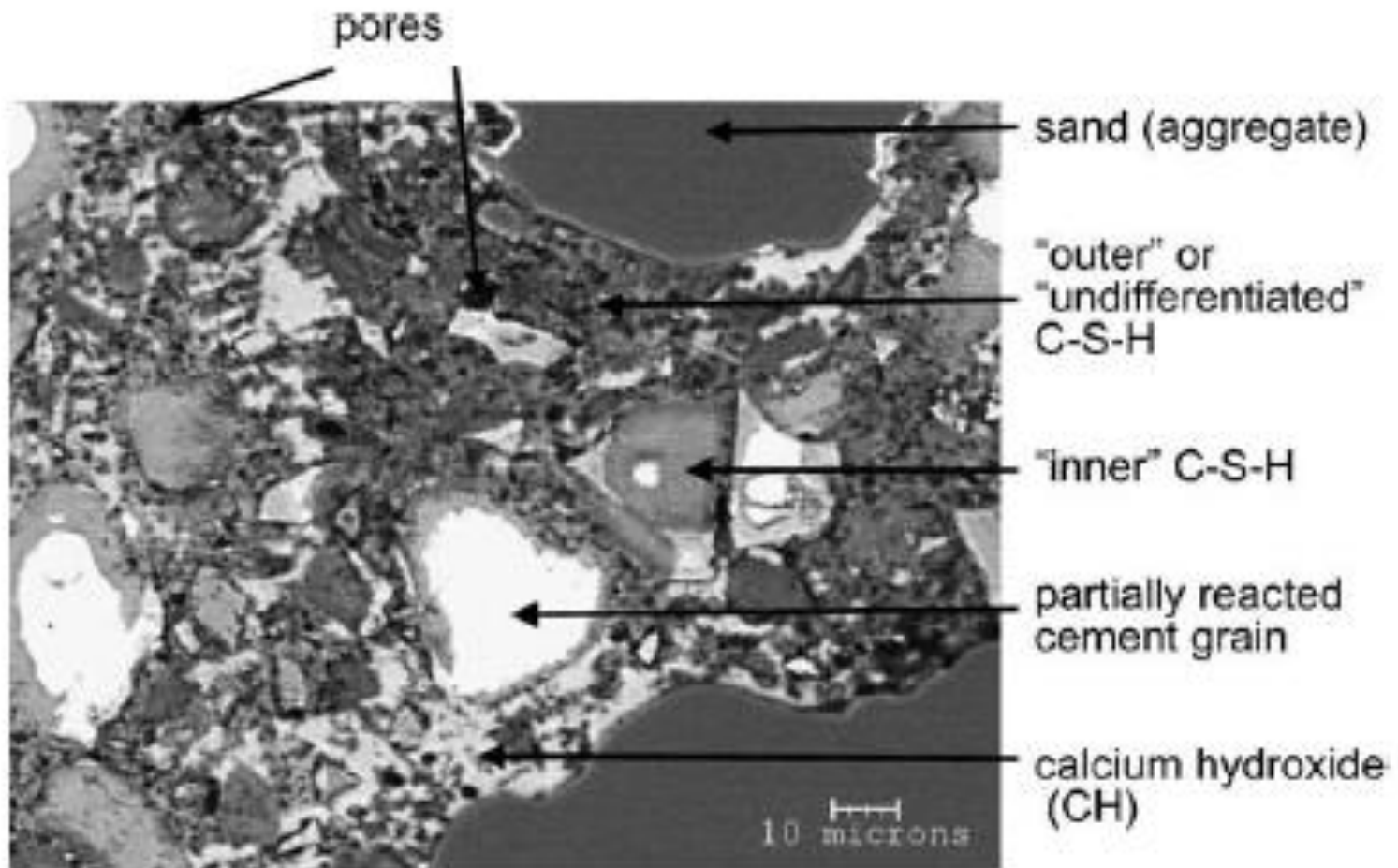


2000X

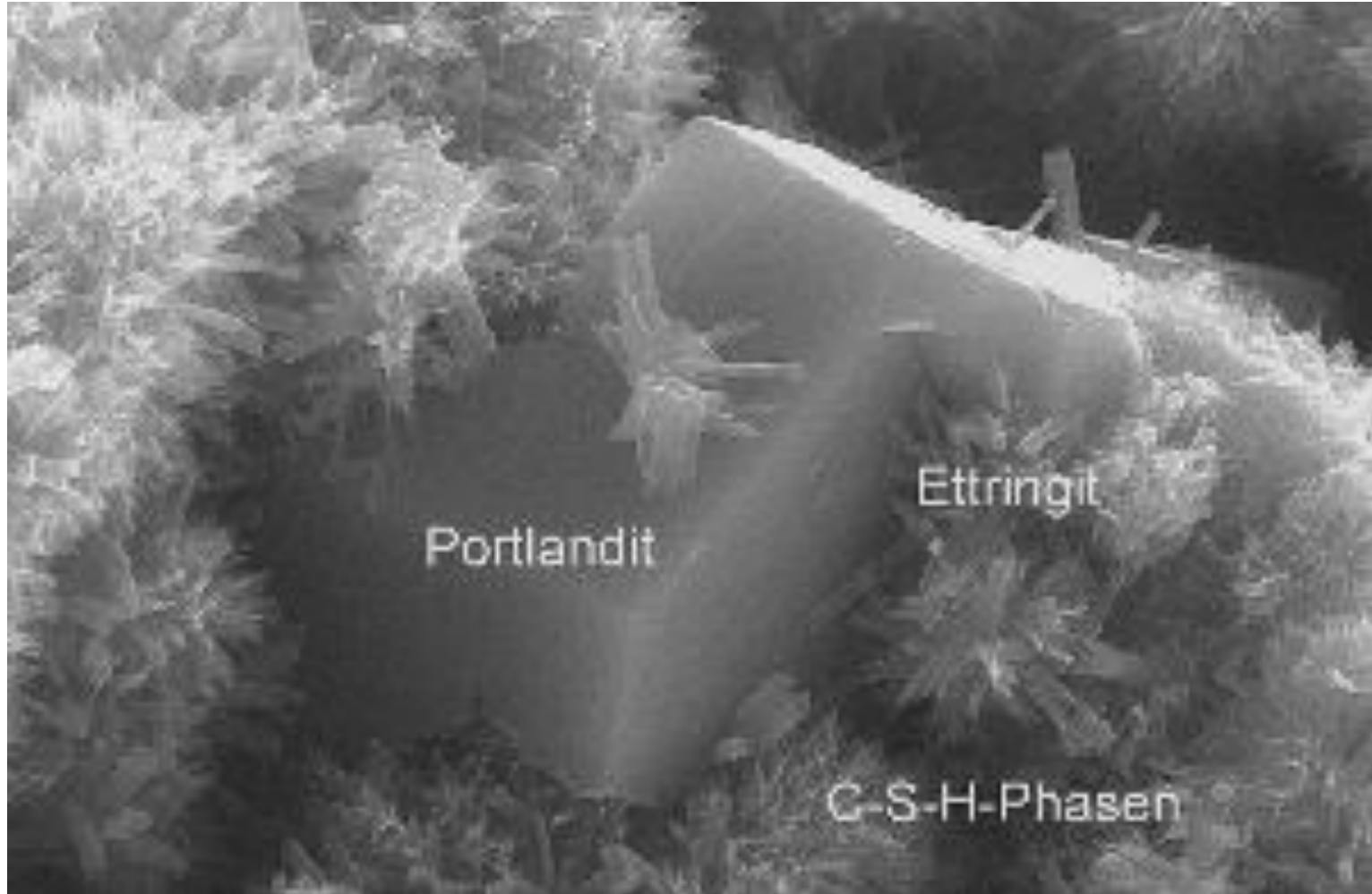


5000 X

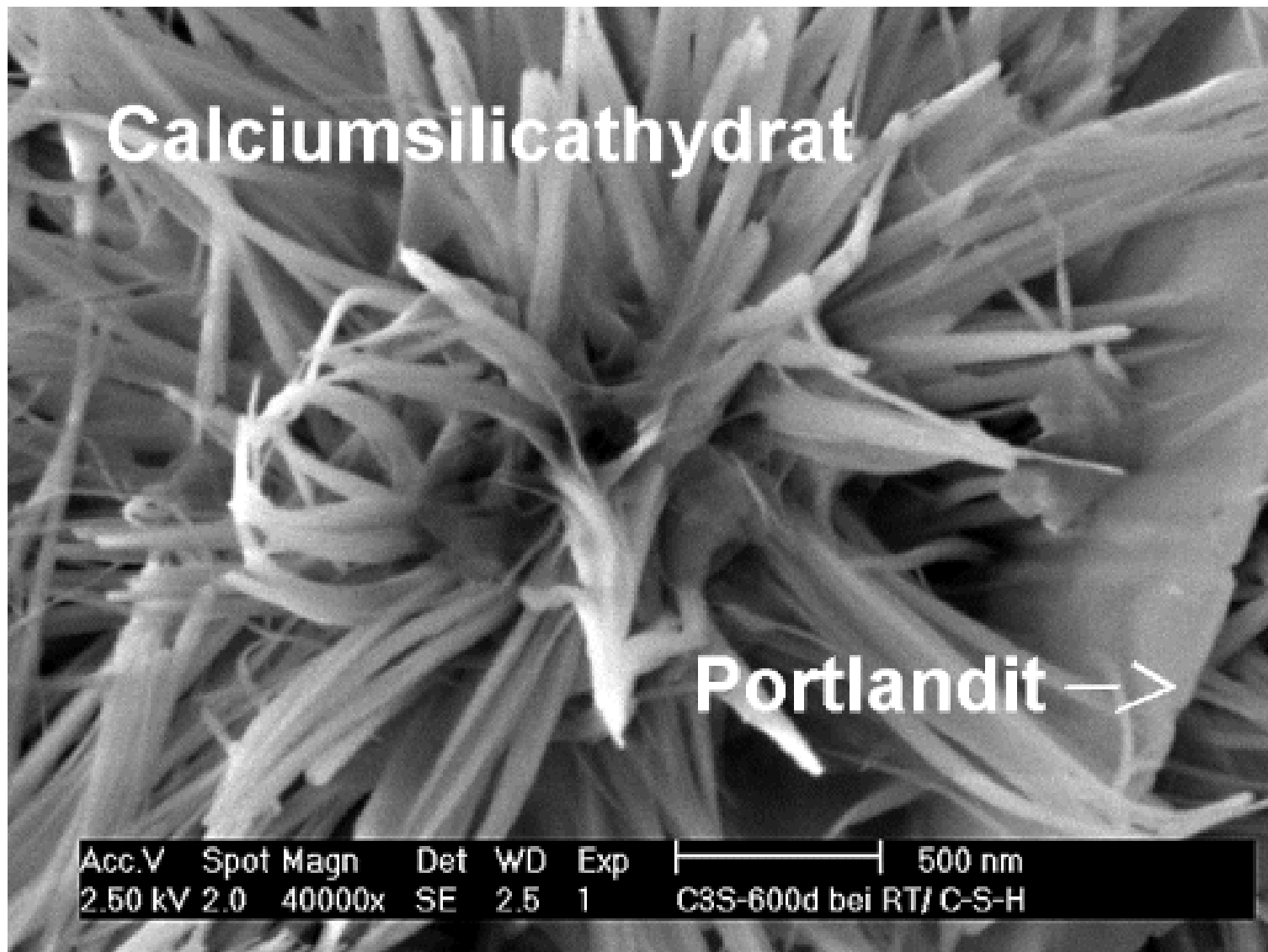
SEM (TARAMALI ELEKTRON MİKROSKOBU) FOTOĞRAFI



ÇİMENTO



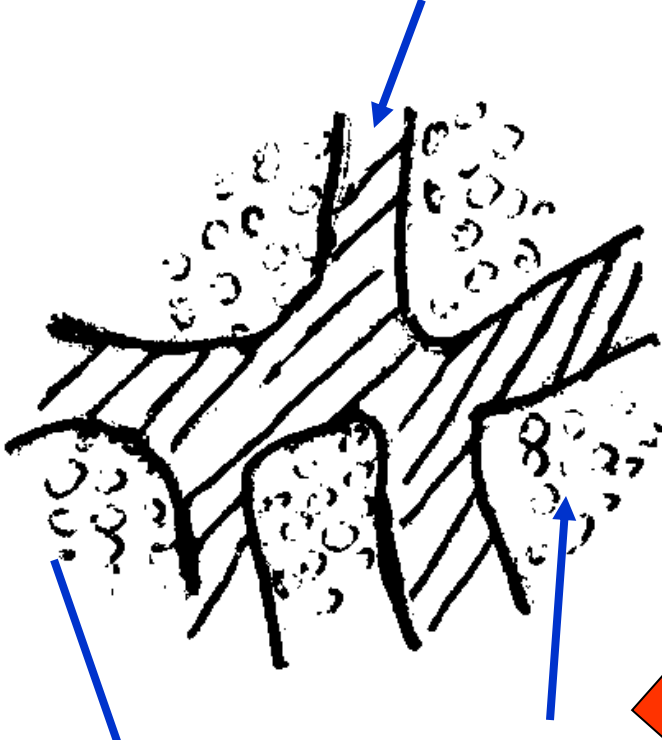
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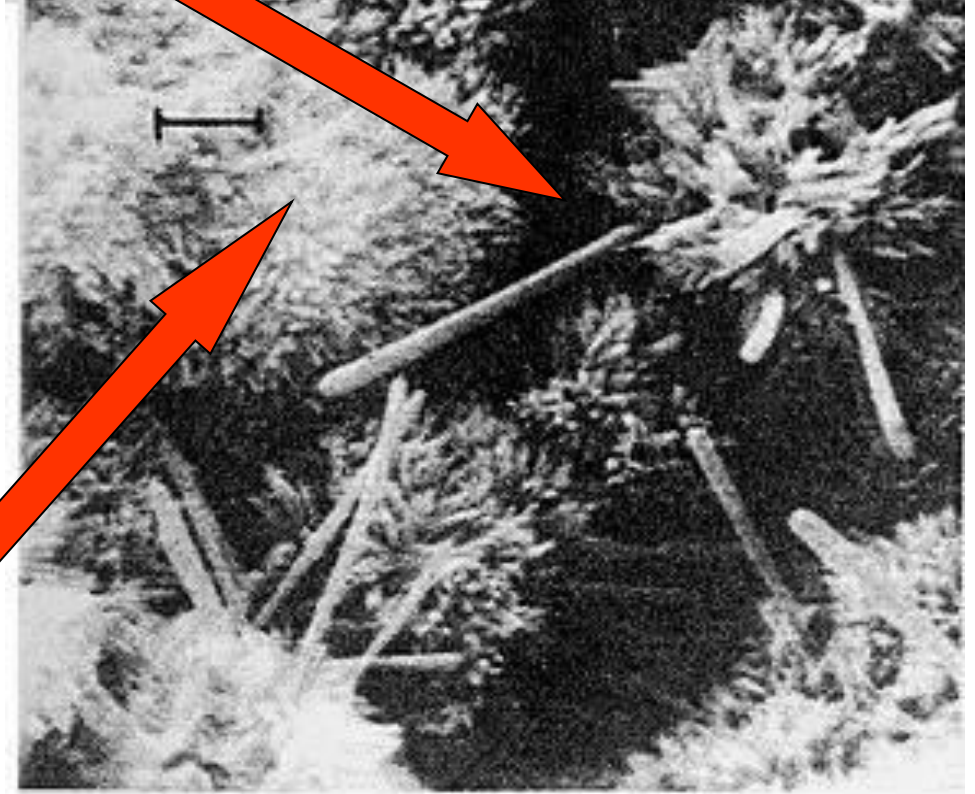
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KAPİLER BOŞLUKLAR

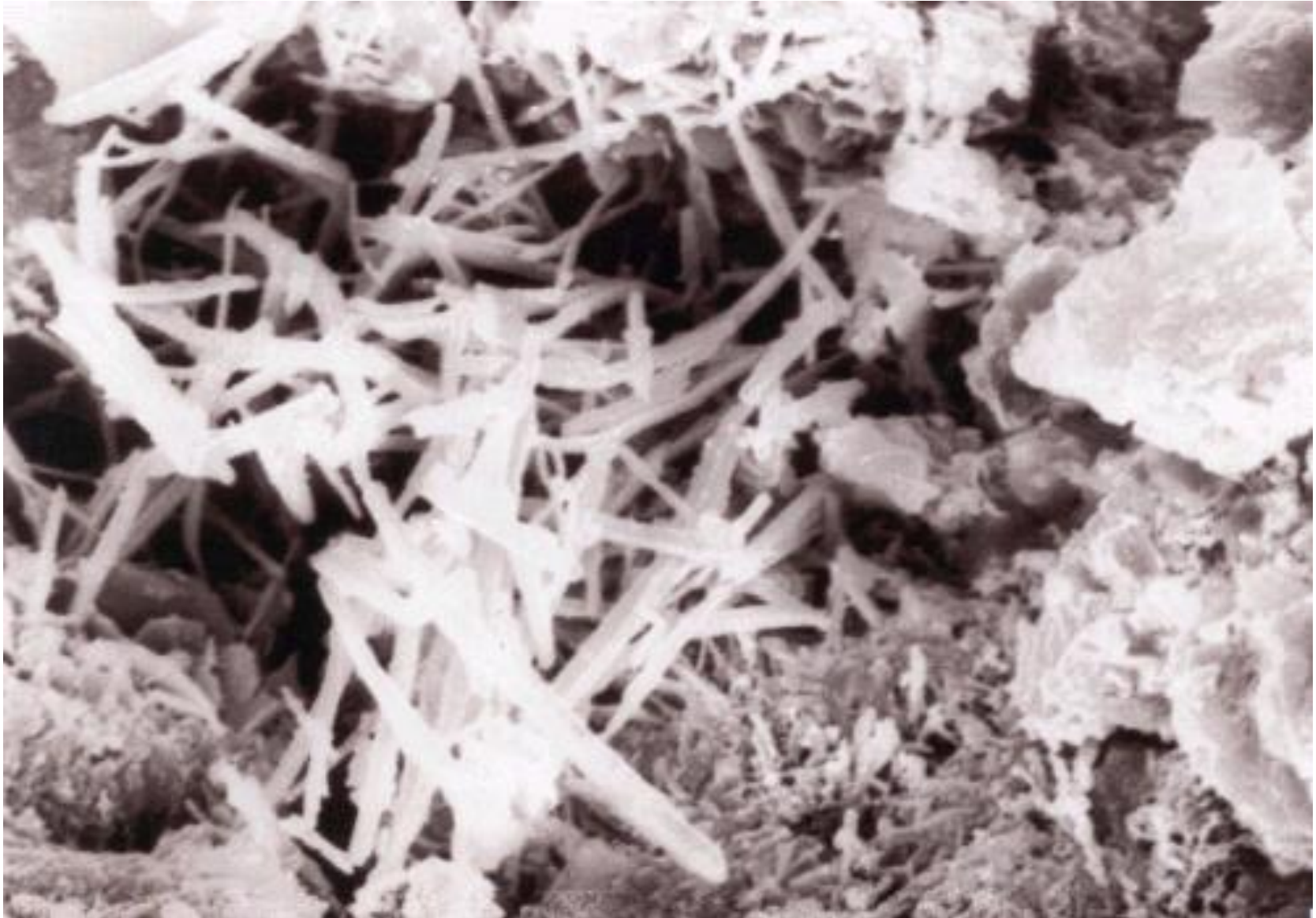


JEL BOŞLUKLARI



JEL PARTİKÜLLERİ (lifsi Yapı, Amorf, Çapraz Bağlı, 90 \AA) CSH + CAH, vb. HİDRATE BİLEŞENLER + Ca(OH)_2 + HİDRATE OLMAMIŞ ÇİMENTO + SU BOŞLUKLARININ BIRAKTIĞI GÖZENEKLER.

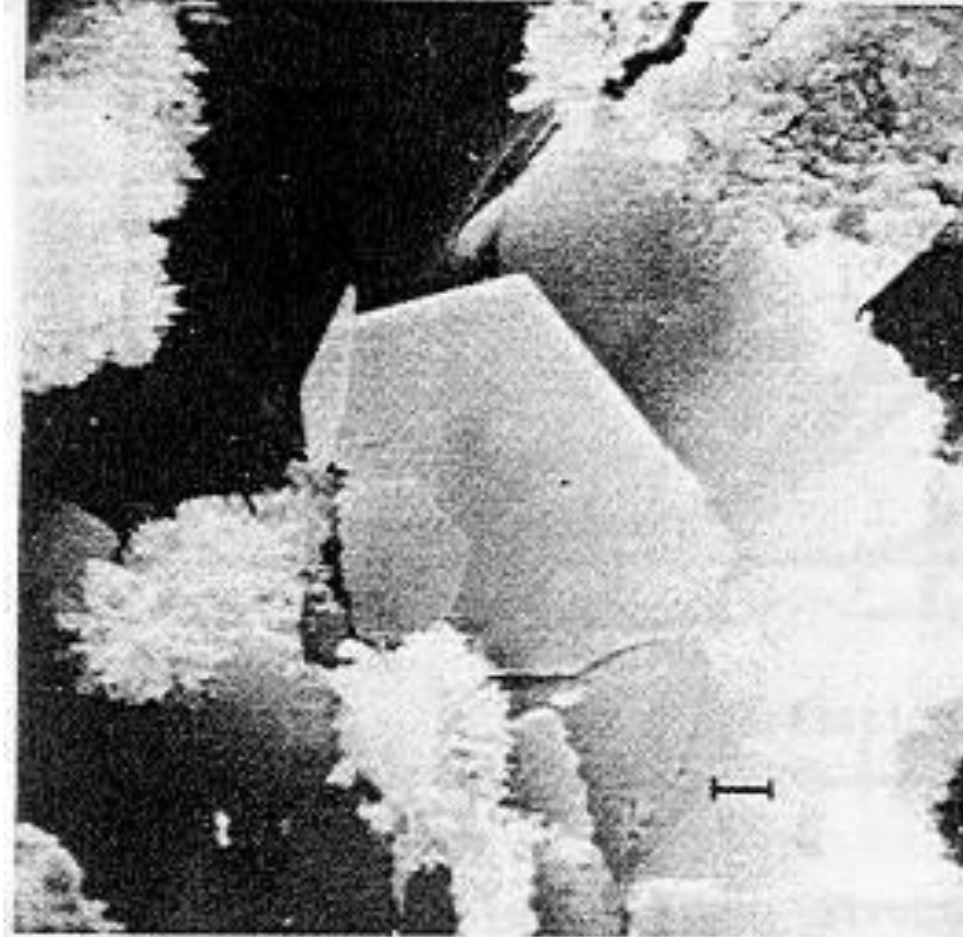
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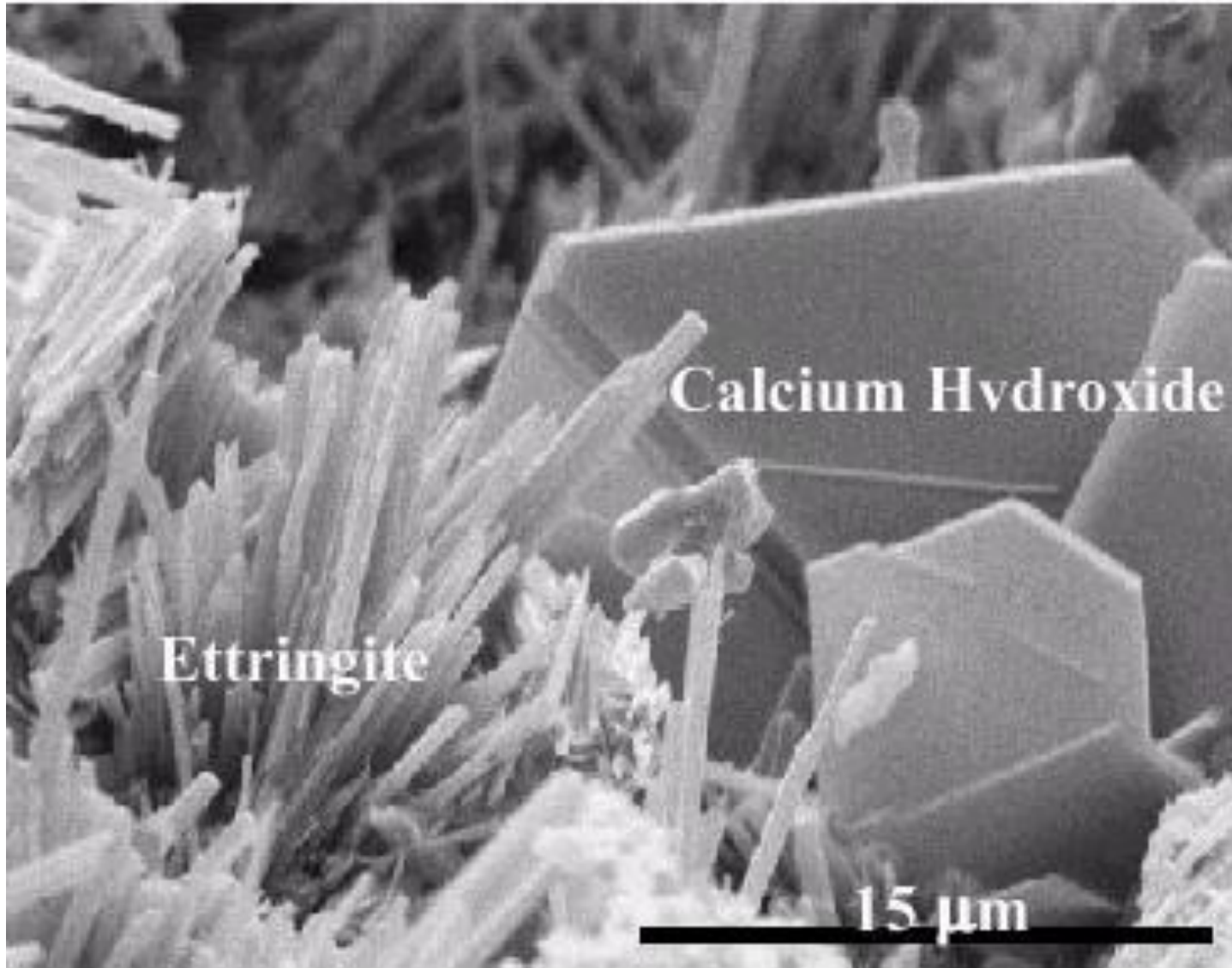
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Ca(OH)₂ ve CSH kristalleri
(S/Ç=0.6 24°C'de 5 gün hidrate olmuş)



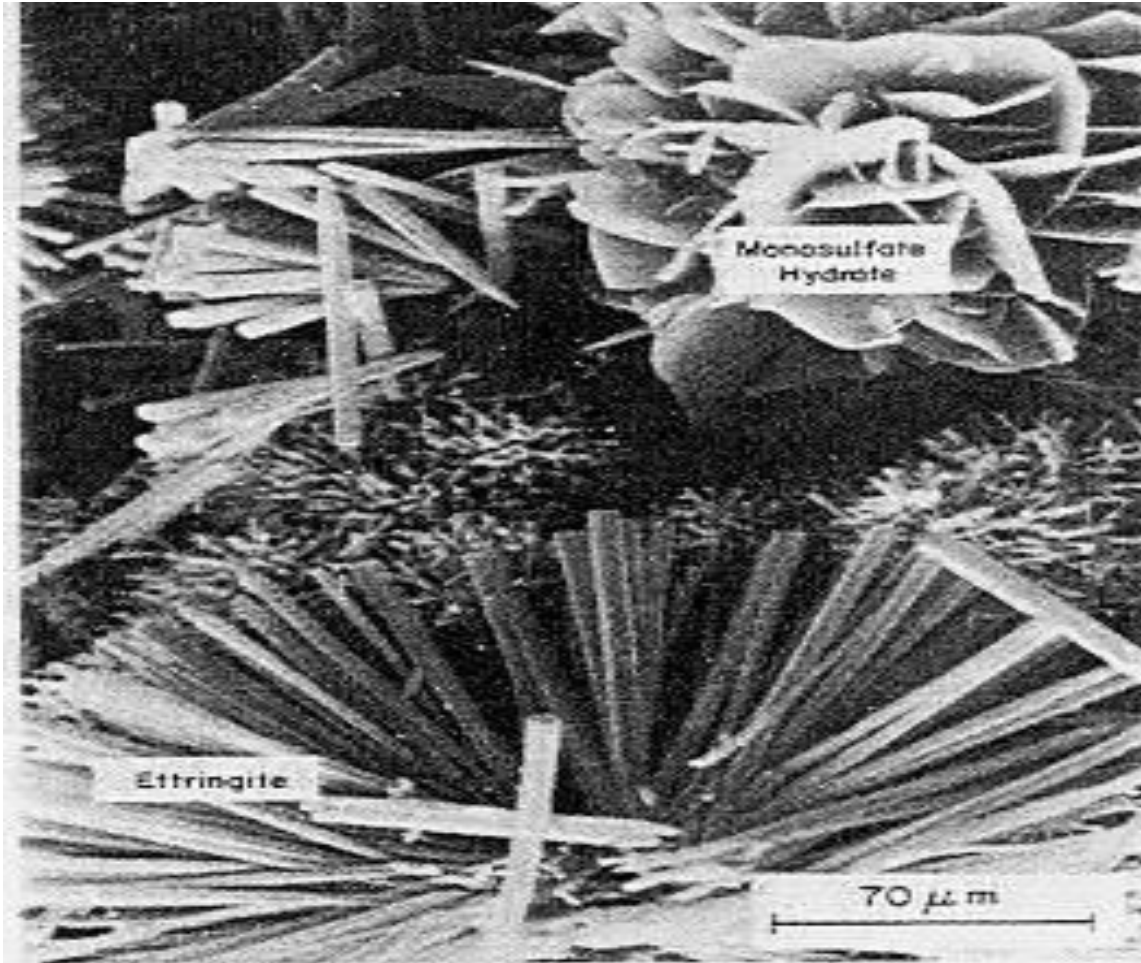
ÇİMENTO



ÇİMENTO



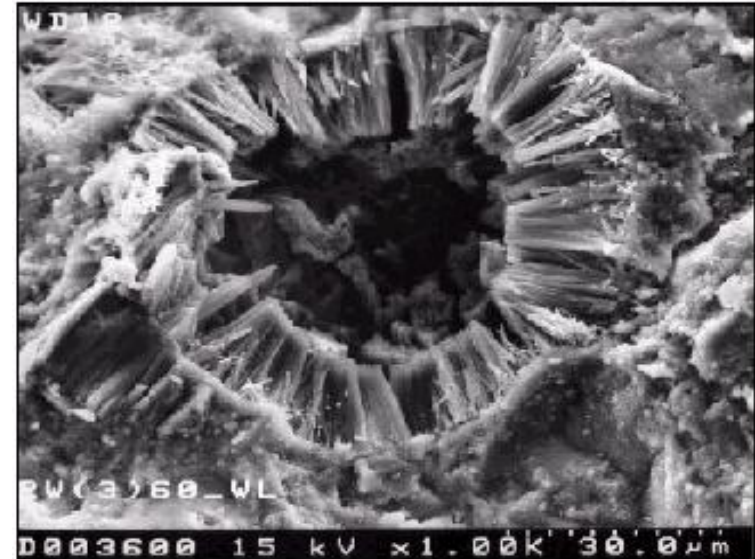
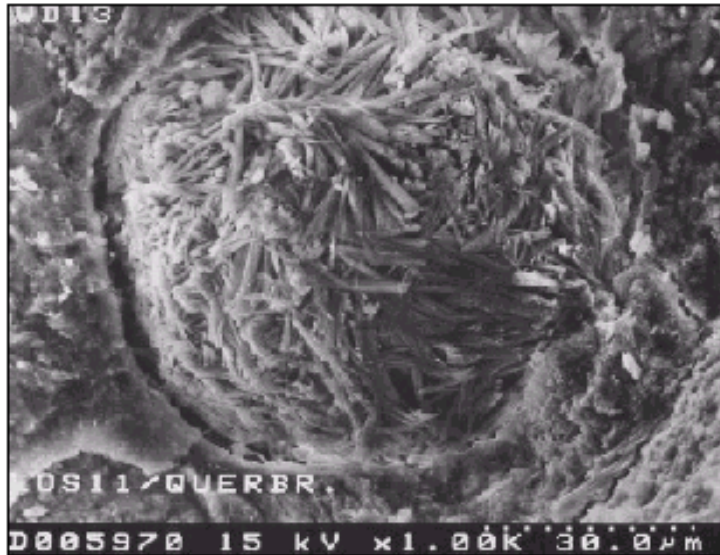
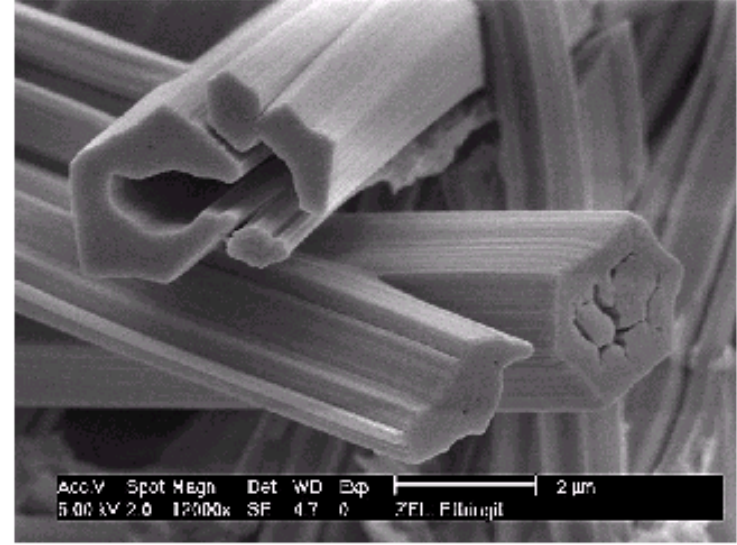
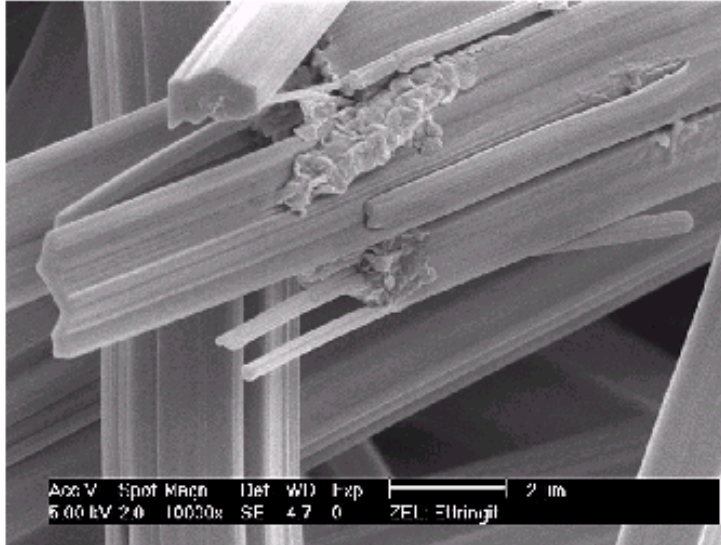
Monosulfat Alimünat ve etrenjit'in
hekzegonal kristal yapısı



ÇİMENTO



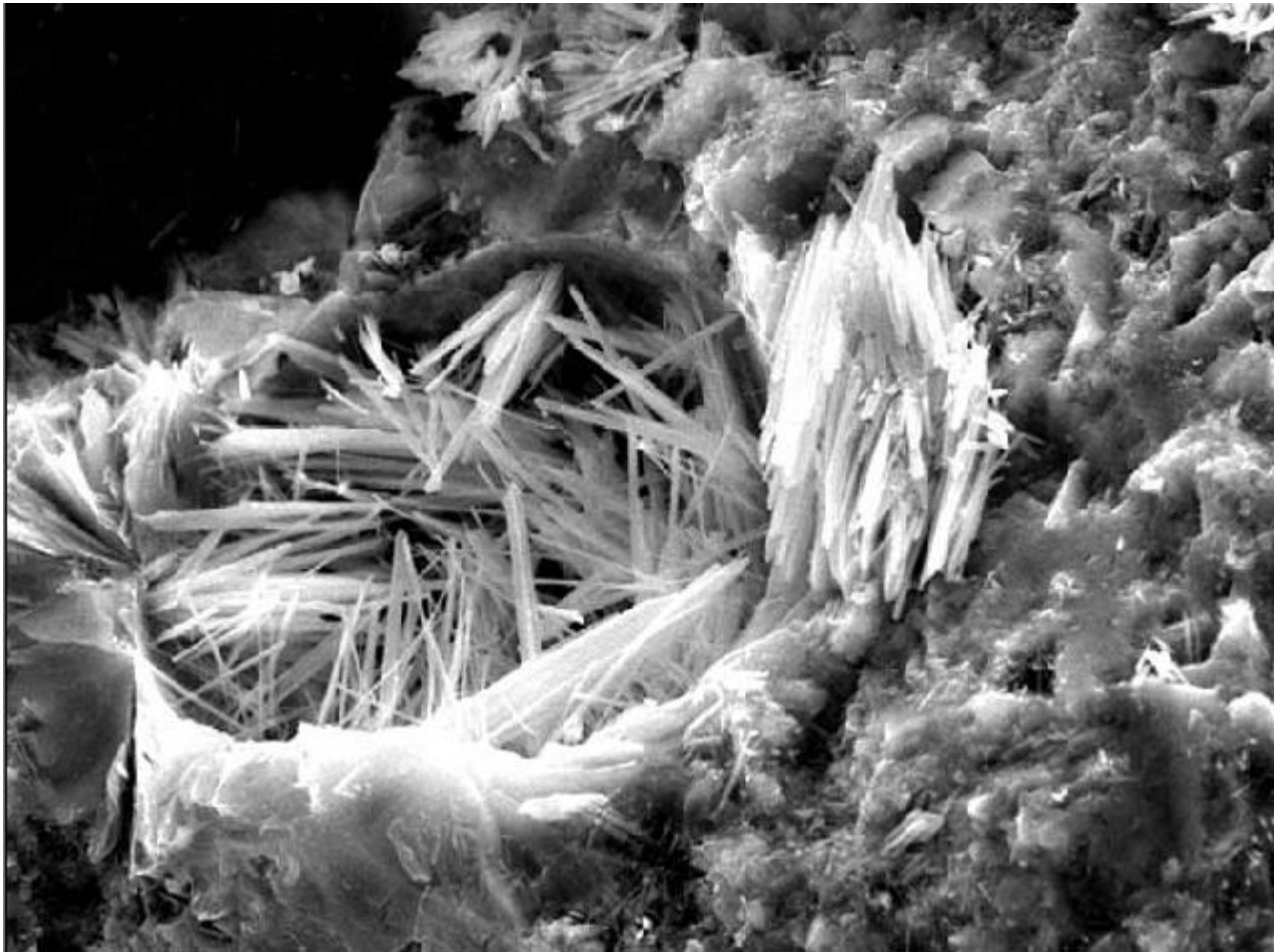
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Etrenjit

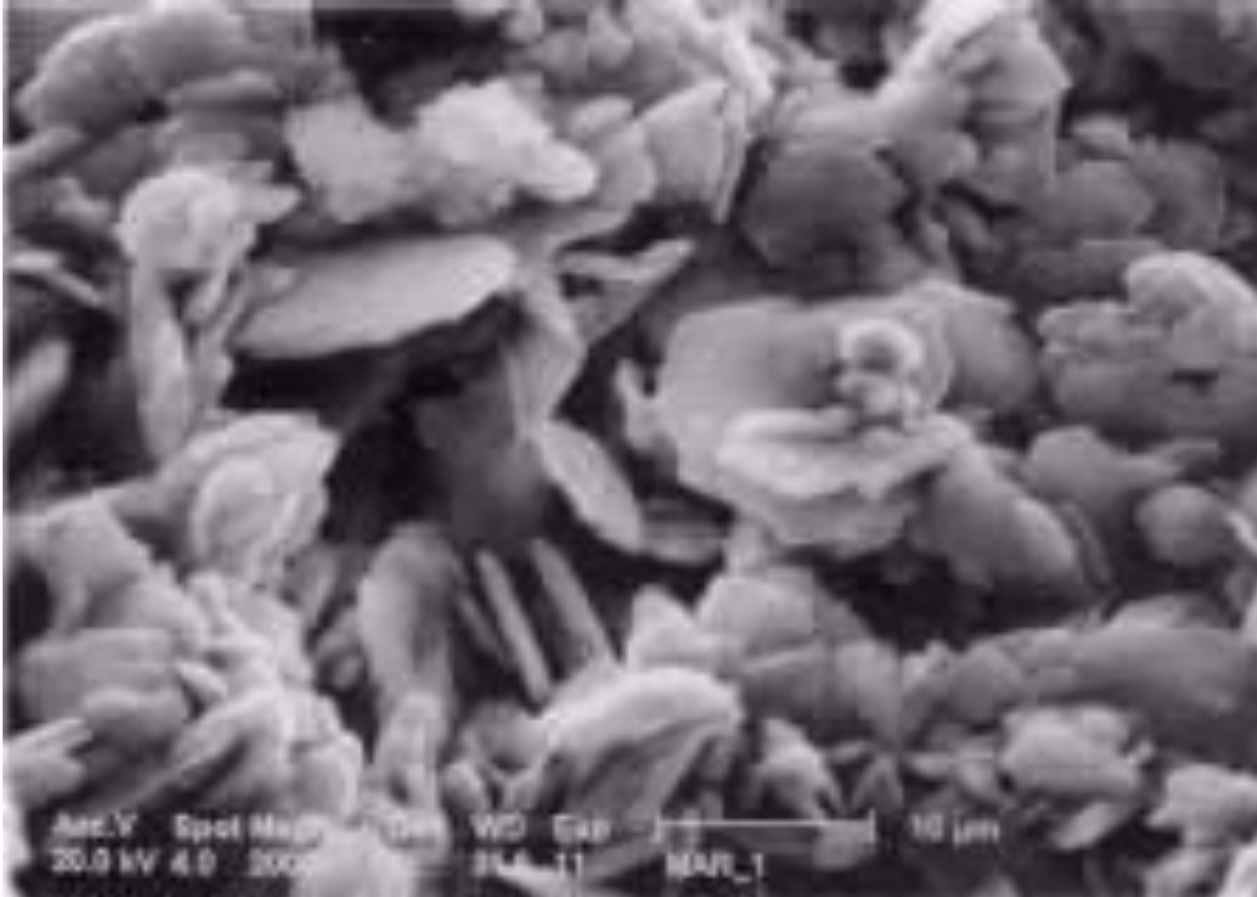


Acc.V	Spot	Mag	Det	WD	30µm
25000	4.8	750	SE	11.6	SMLV18.TIF

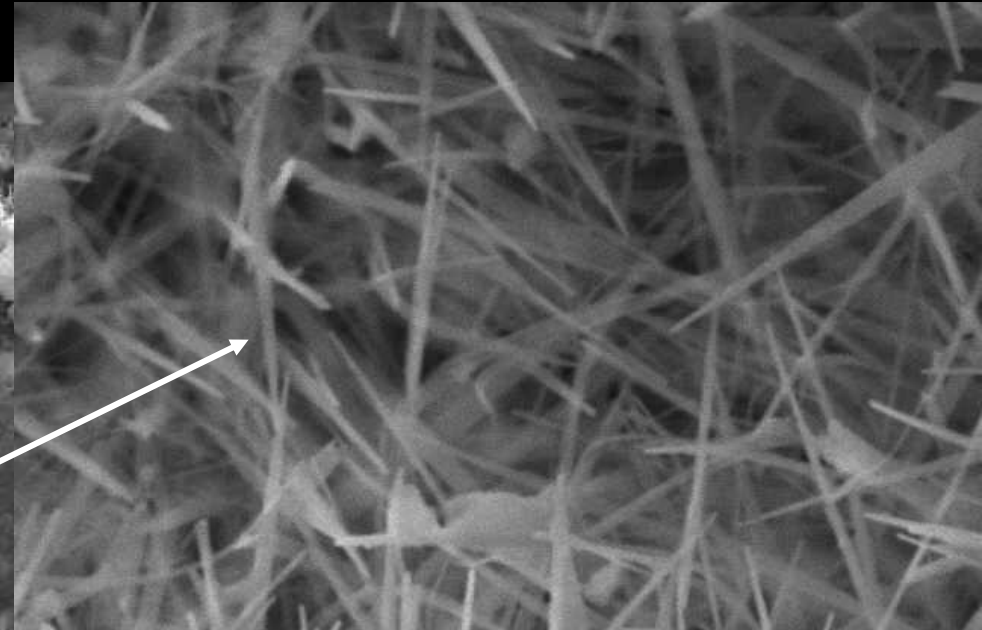
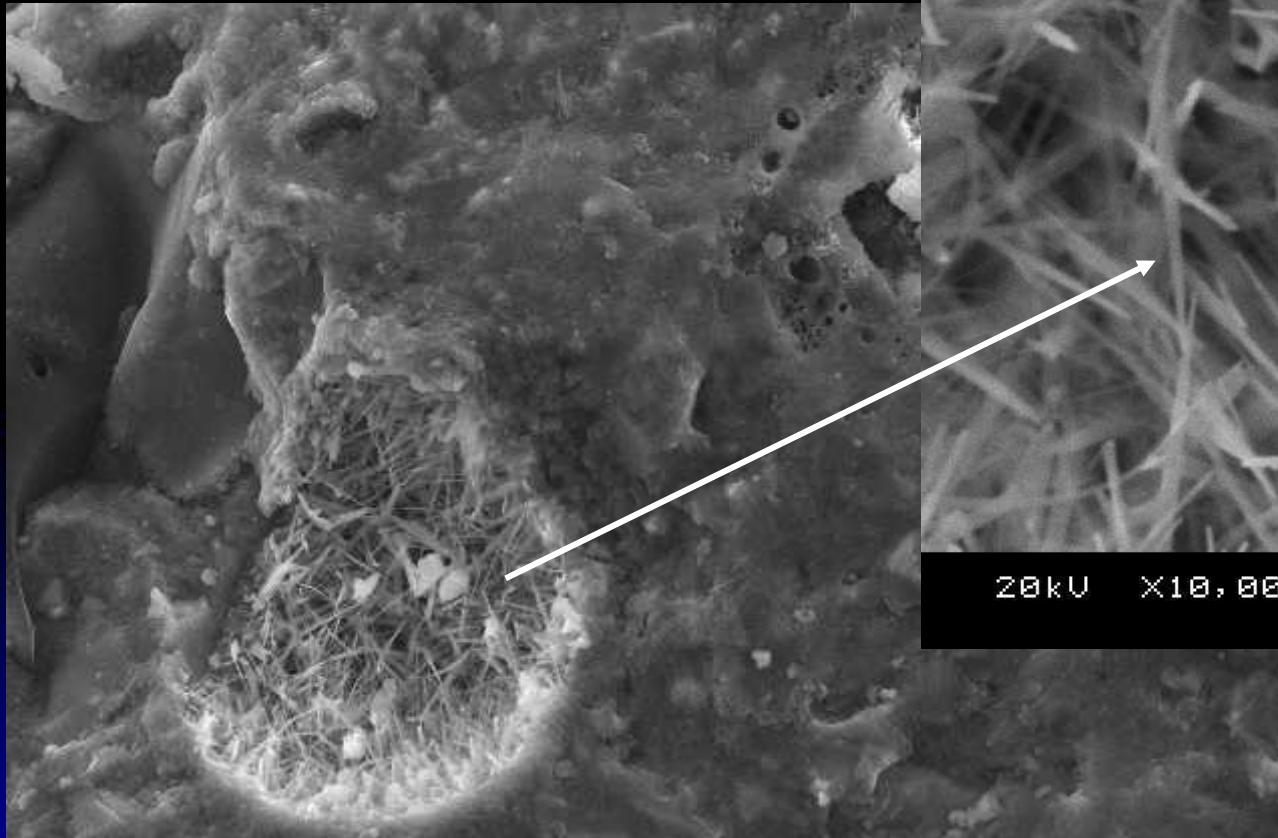
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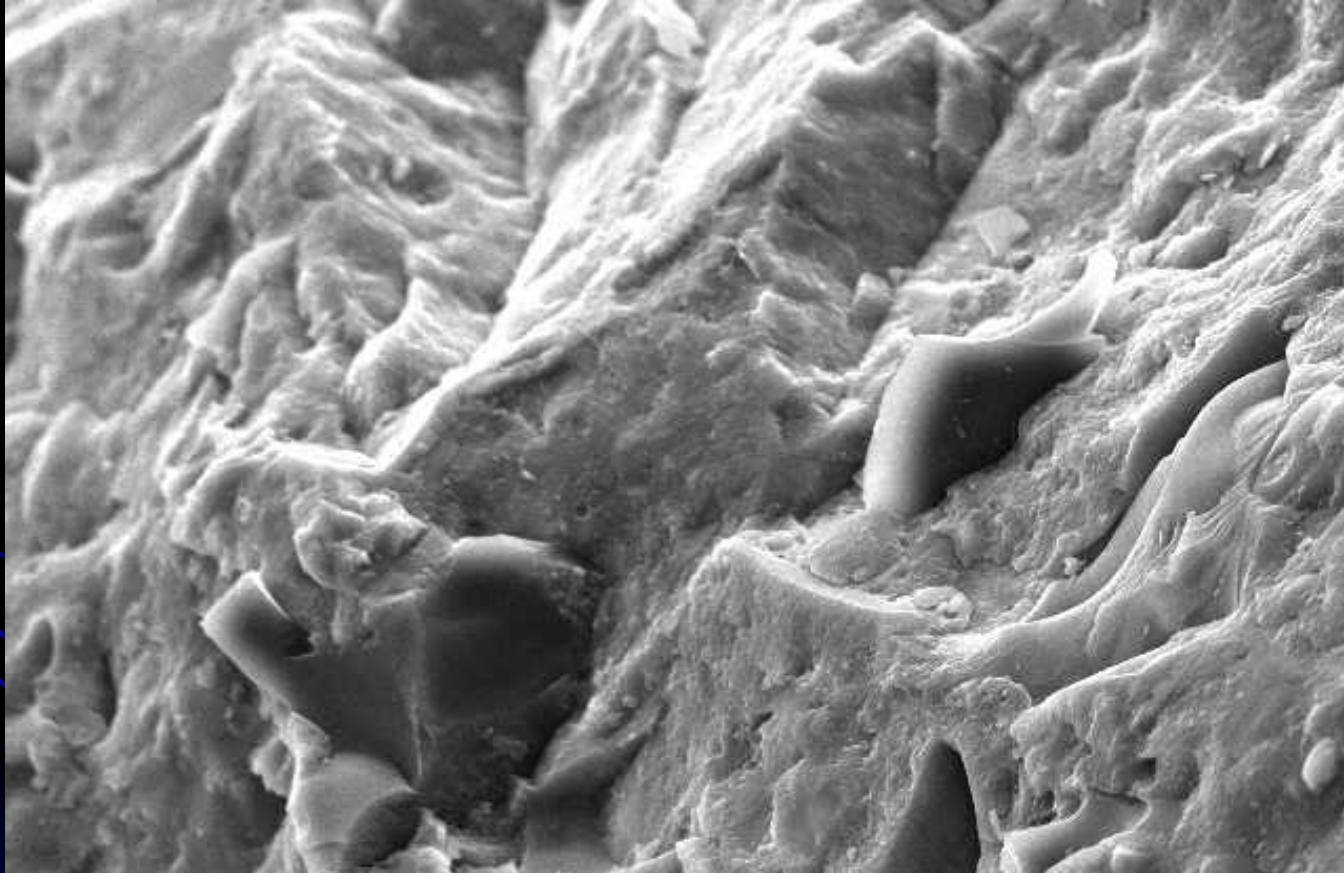
Monosülfat



OTOKLAV KÜRÜ GEÇİRMİŞ KONTROL NUMUNELERİNİN (BASINÇ DAYANIMI=285 MPa) İÇ YAPISI



BASINÇ ALTINDA SIKIŞTIRILMIŞ VE OTOKLAV KÜRÜ GEÇİRMİŞ KONTROL NUMUNELERİNİN (BASINÇ DAYANIMI=400 MPa) İÇ YAPISI

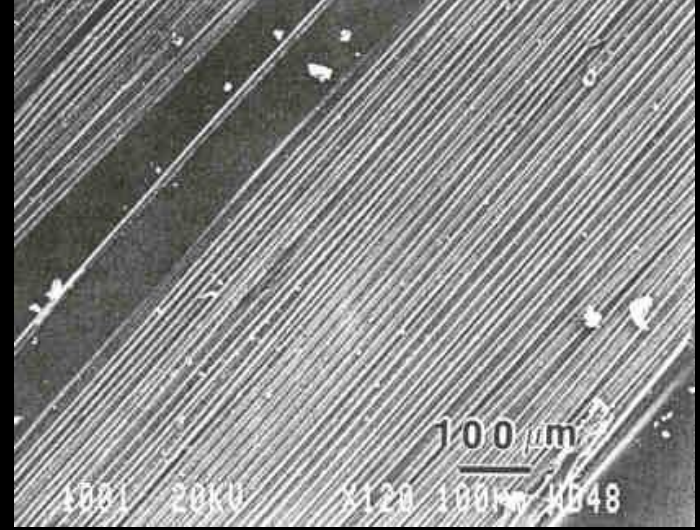


20kV X1,000 10µm 0024 11 45 SEI

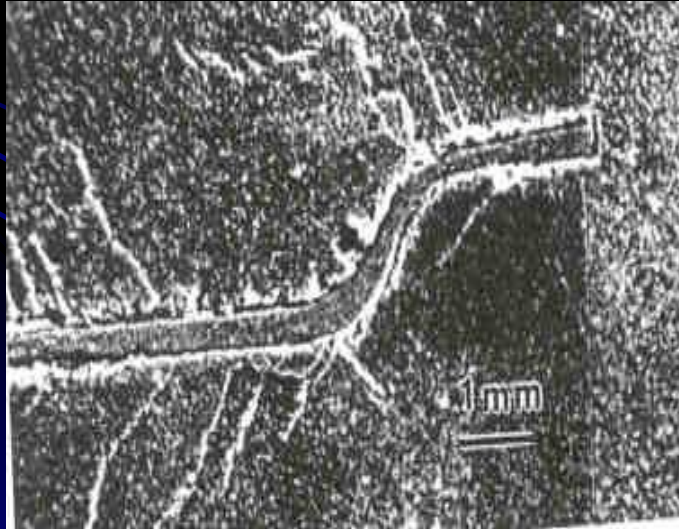
LİFLİ BETON ÇEŞİTLERİ



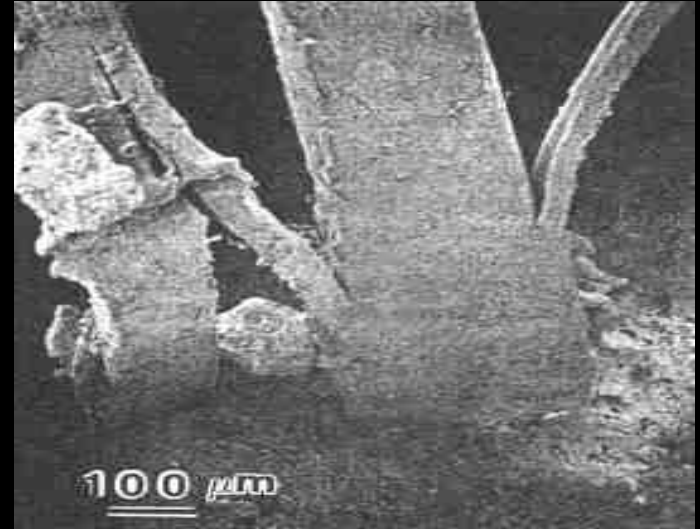
KARBON LİFLİ



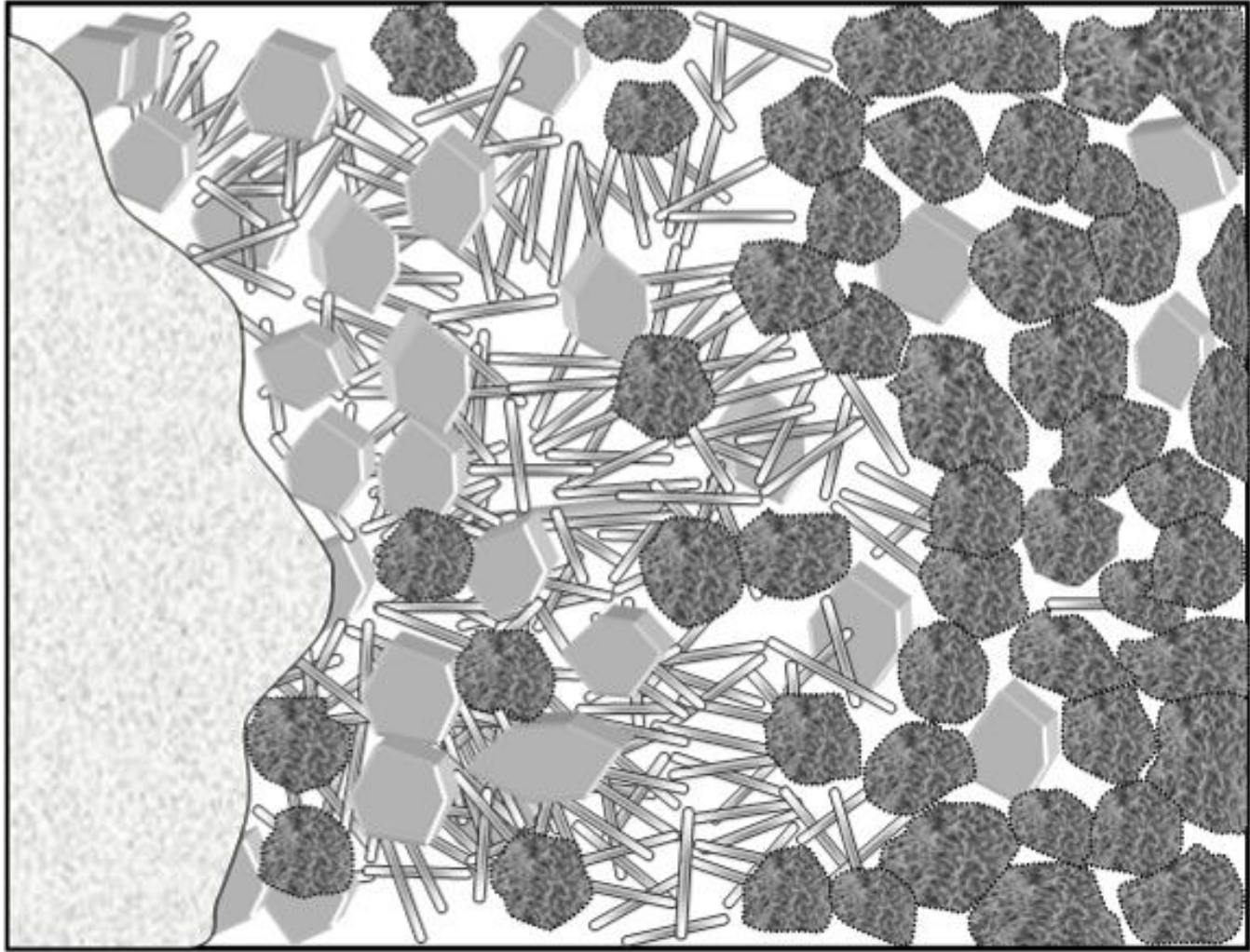
CAM LİFLİ



ÇELİK LİFLİ



POLİPROPİLEN LİFLİ



← Agrega → Ara yüzey → Çimento hamuru →



C-S-H



C-H

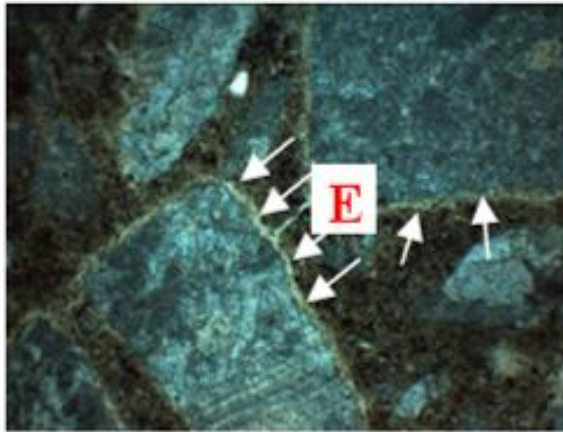
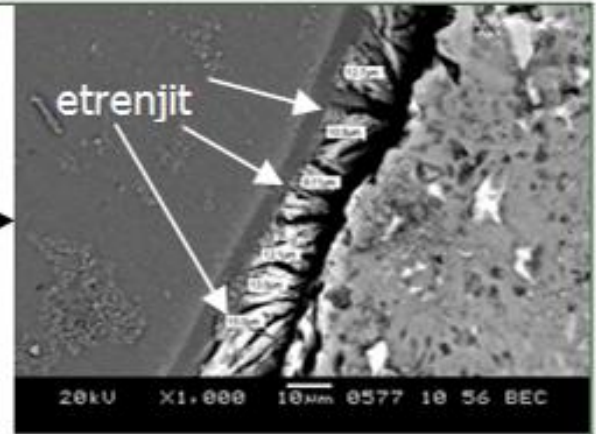


C-A-S-H (Etrenjit)



**Parlak kesit,
SEM**

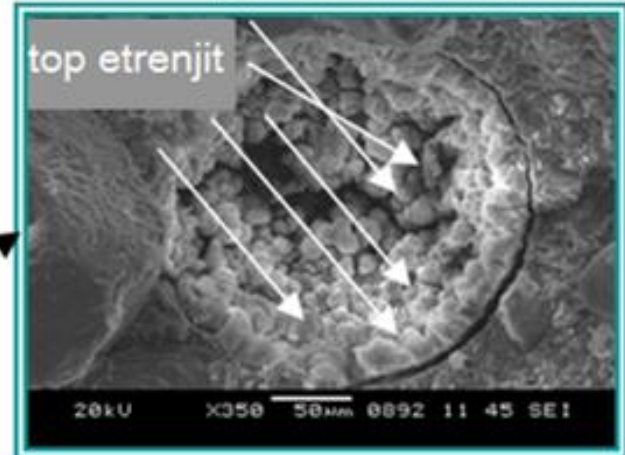
**1000 kat büyütme
BSE (geri saçılmalı
elektron) modu**



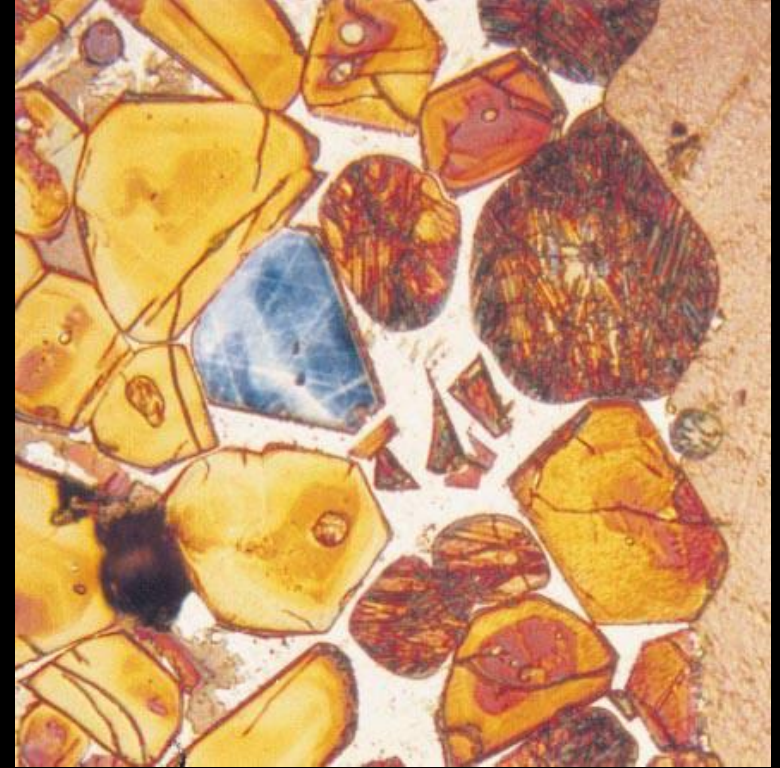
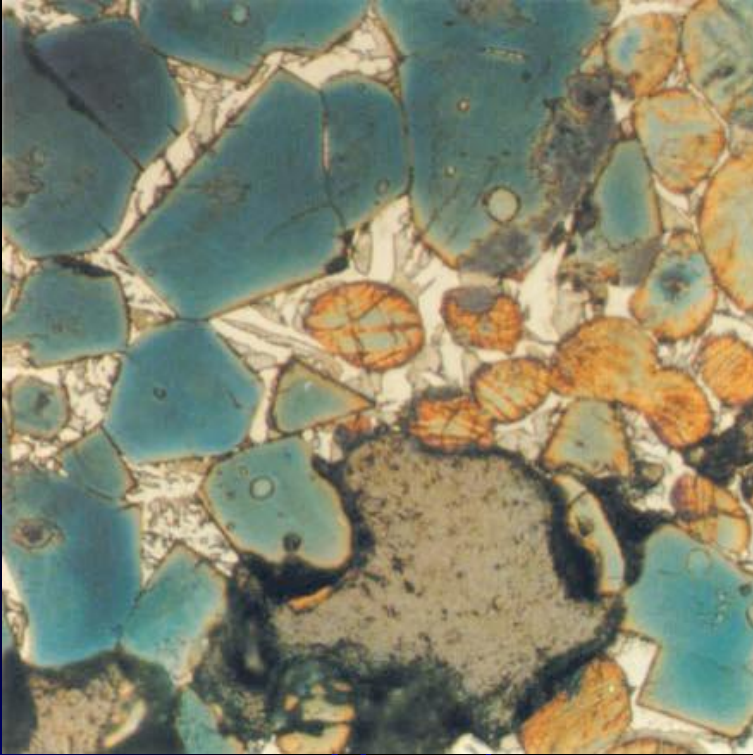
**İnce kesit,
optik mikroskop
400 kat büyütme**

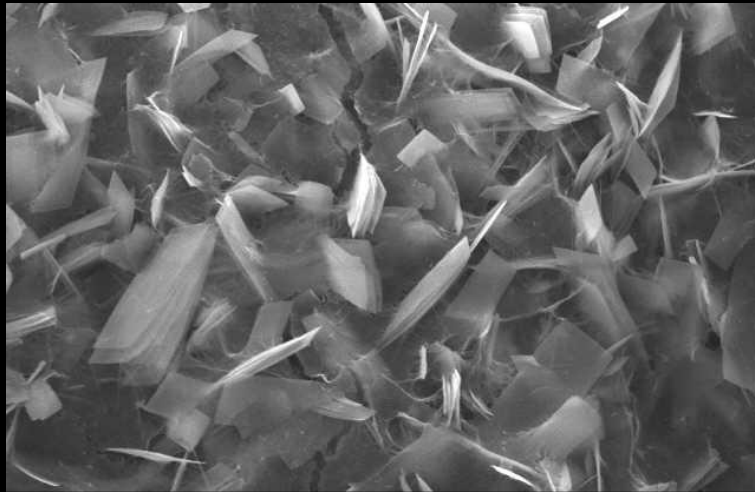


**Kırık yüzey,
SEM
350 kat büyütme
SE (İkincil elektron)
modu**



DAĞLAMA İŞLEMİ VE FARKLI FAZLAR



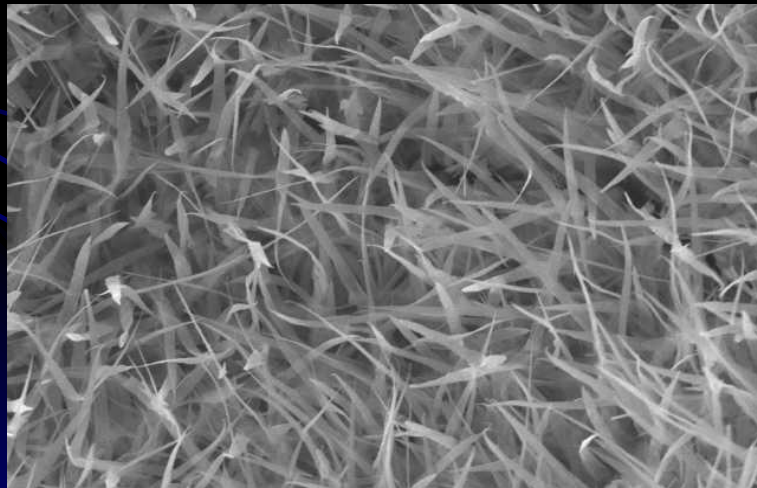


20kV X3,000 5µm 0613 12 45 SEI

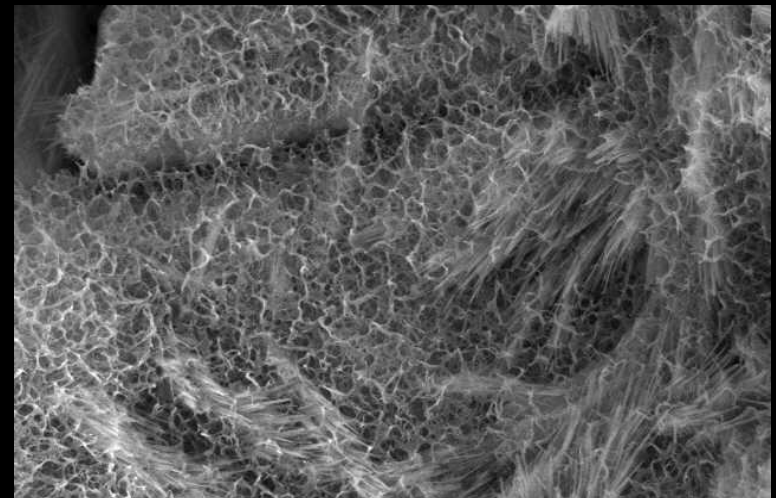


20kV X1,000 10µm 0613 09 45 SEI

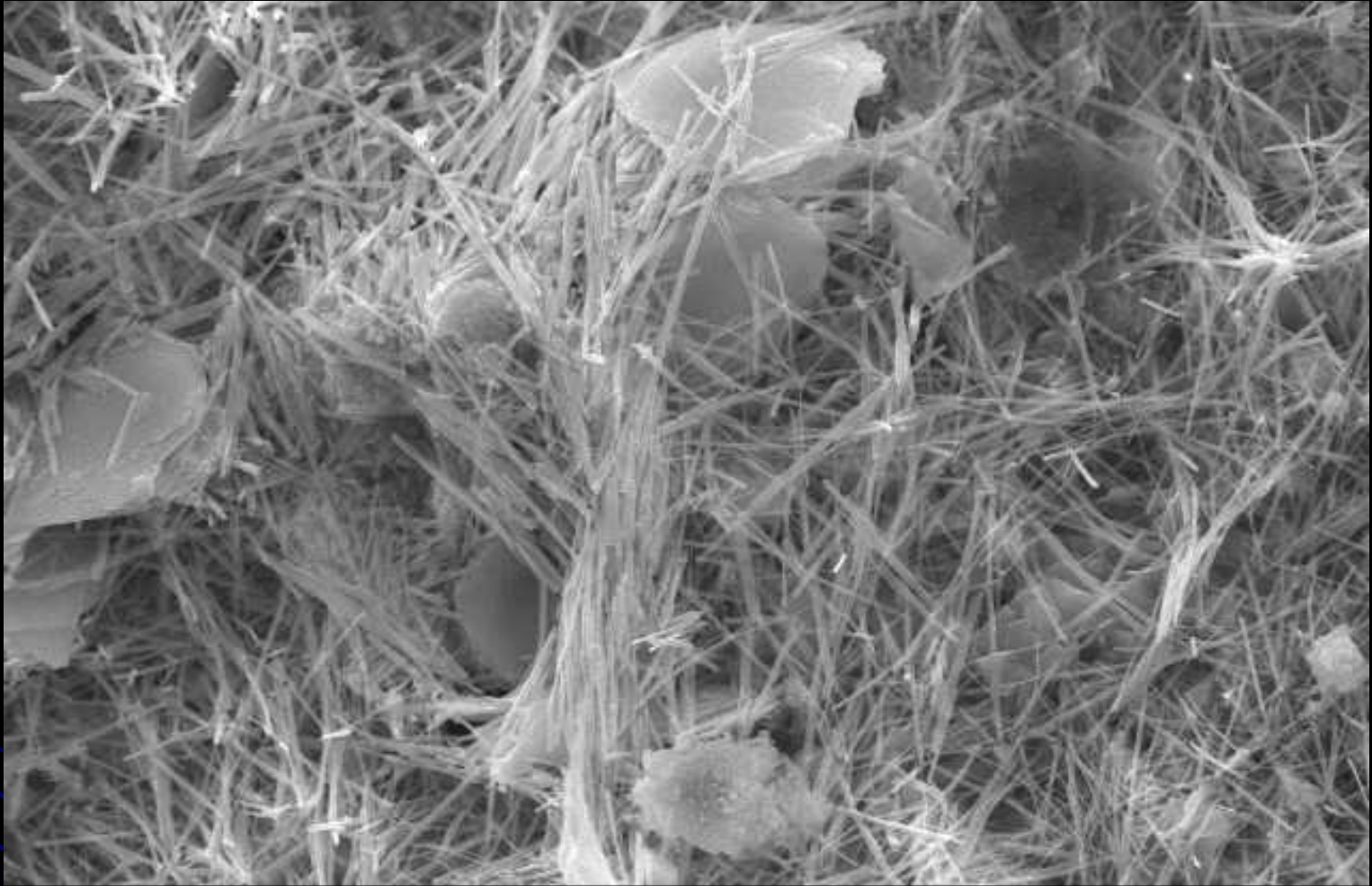
ASR jeli



20kV X3,000 5µm 0613 10 45 SEI

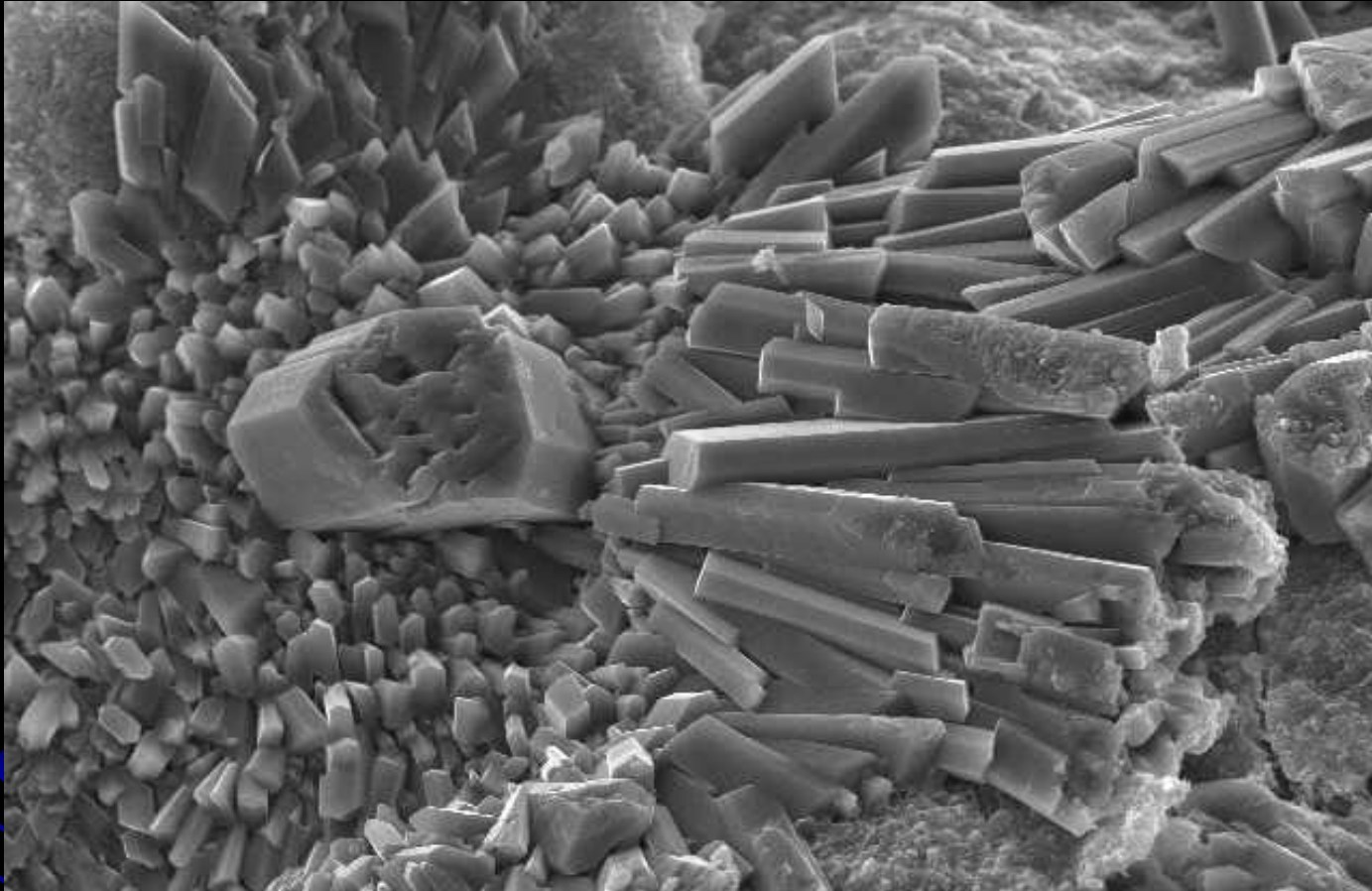


20kV X3,000 5µm 0537 13 45 SEI



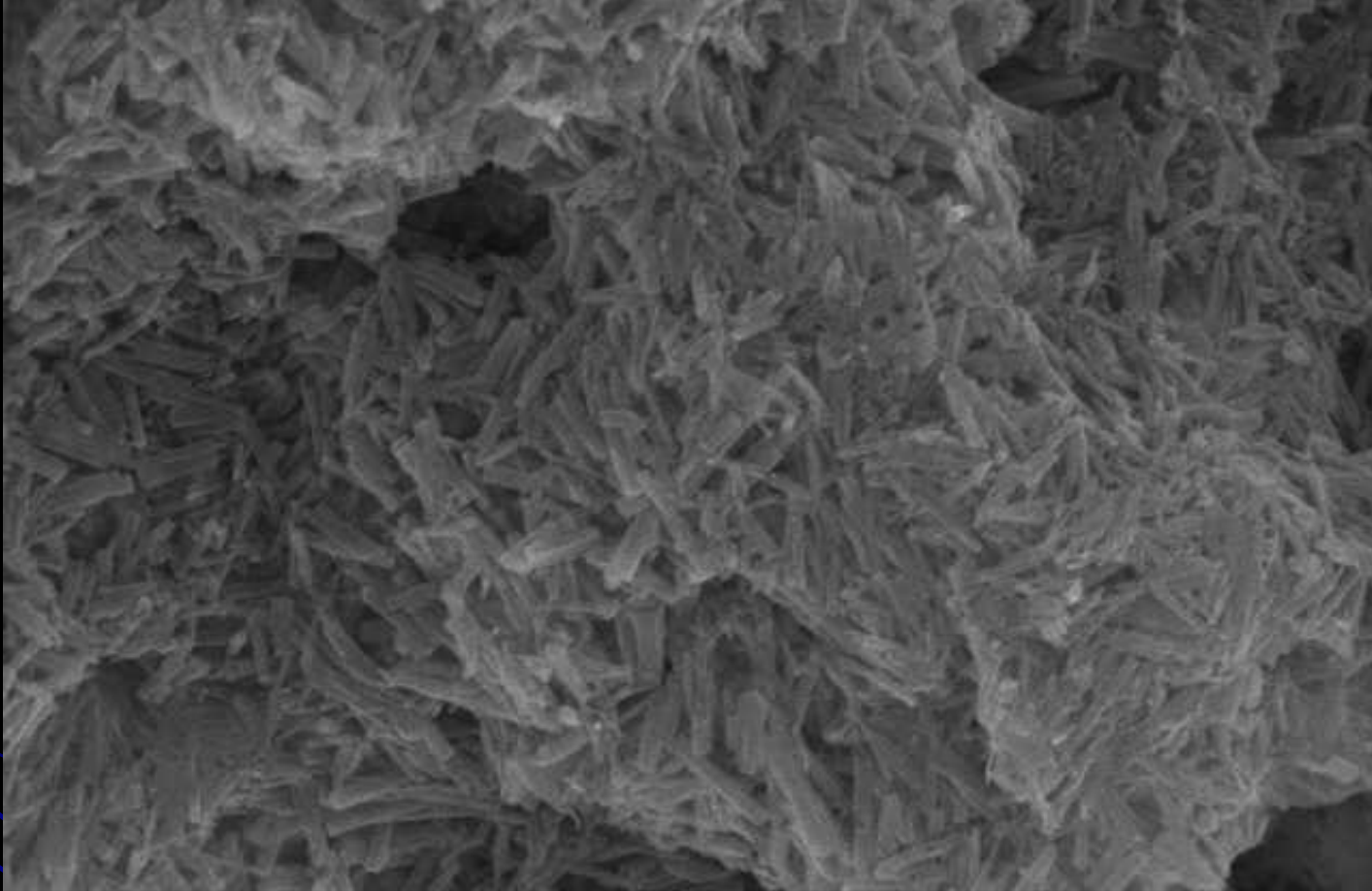
20kV X2,000 10µm 0281 11 45 SEI

Sülfat saldırısı sonucu oluşan
etrenjit kristalleri



20kV X1,000 10µm 0343 12 42 SEI

Sülfat saldırısı sonucu oluşan
alçıtaşı



20kV X5,000 5µm 0343 11 42 SEI

Tomasit oluşumu



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