DTU Byg
Institut for Byggeri og Anlæg

INNOVATION DAY 2013

DTU

Elastic moduli of minerals

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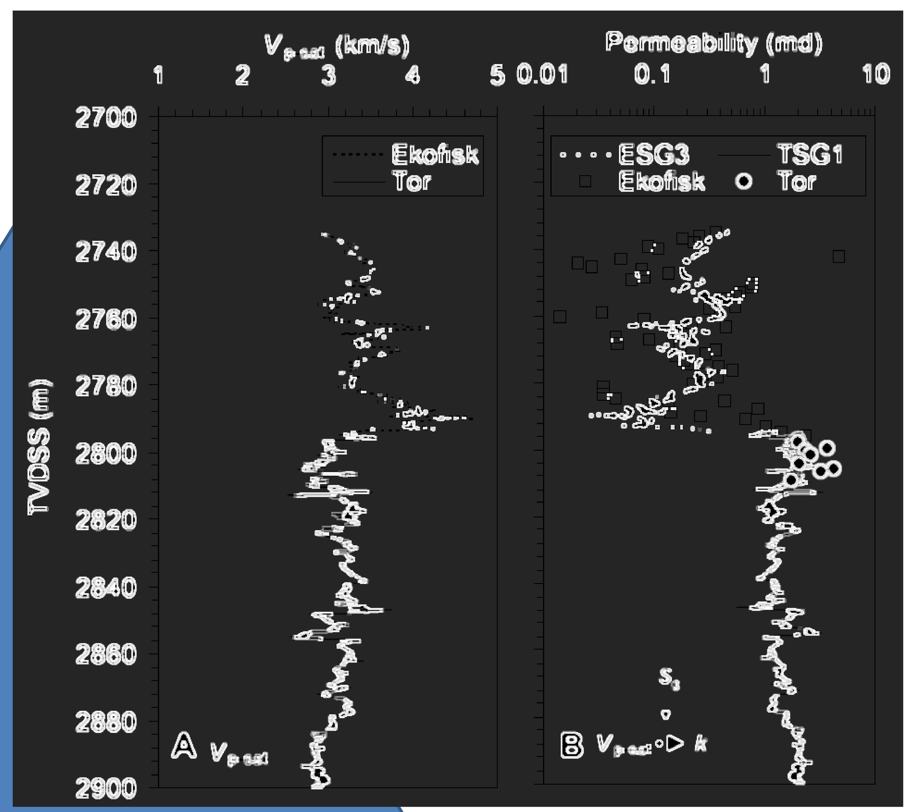
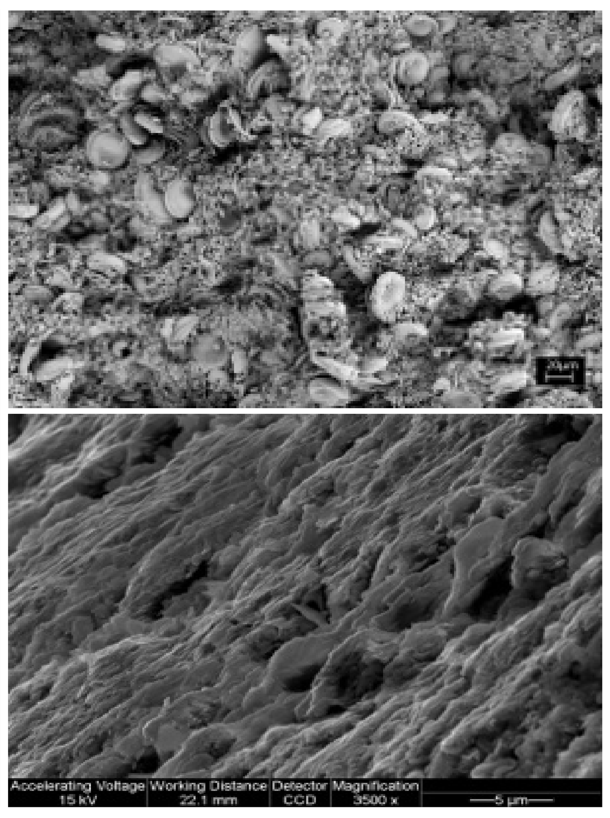




Rock physics

Application. Interpreting information from seismic surveys of geological areas and petrophysical logging of boreholes. This method will help obtaining information on fluid content, elasticity, and strength.

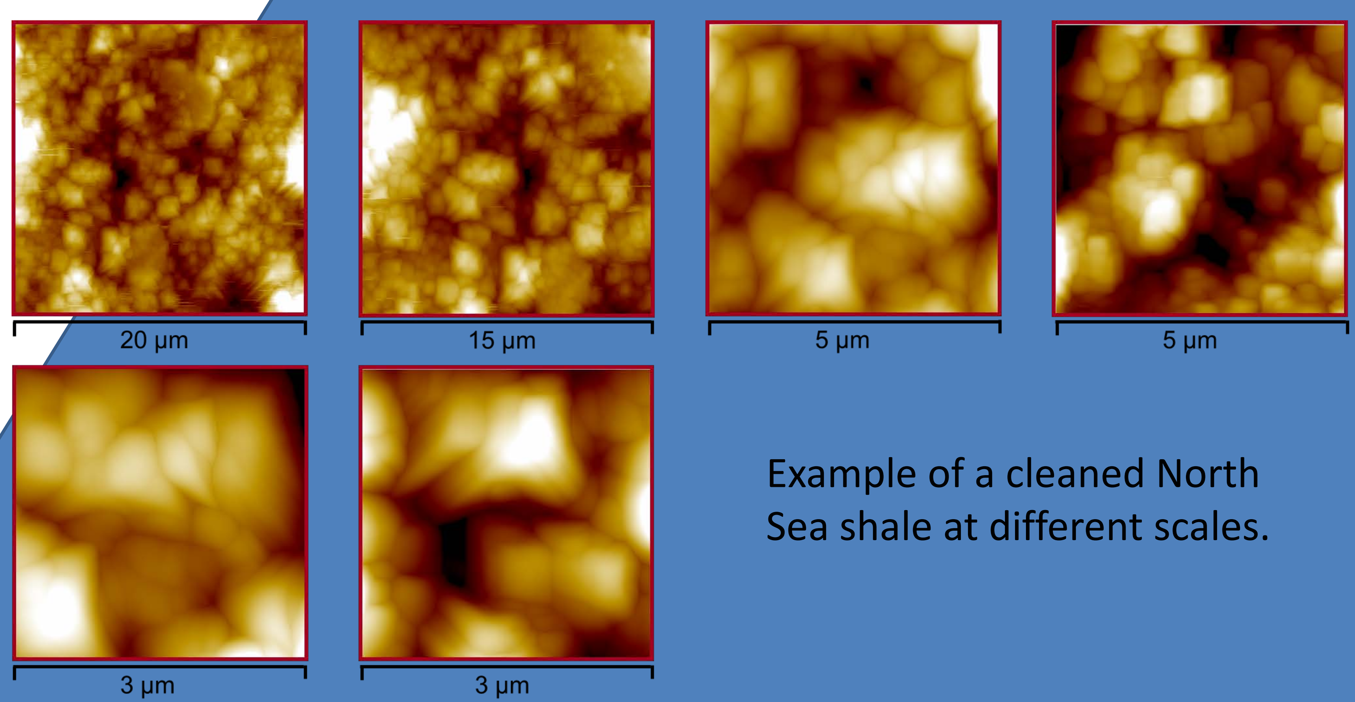
Example: For quantifying the effect of alternative pore fluids, Gassmann's equation is used: $\frac{K}{K_{\text{min}}-K} = \frac{K_{\text{frame}}}{K_{\text{min}}-K_{\text{frame}}} + \frac{1}{\varphi}\frac{K_{\text{fluid}}}{K_{\text{min}}-K_{\text{fluid}}}$

Example: For quantifying relation among elasticity and strength, Biot's coeffecient, α, is used: $\alpha = 1 - \frac{K_{\text{frame}}}{K_{\text{min}}}$

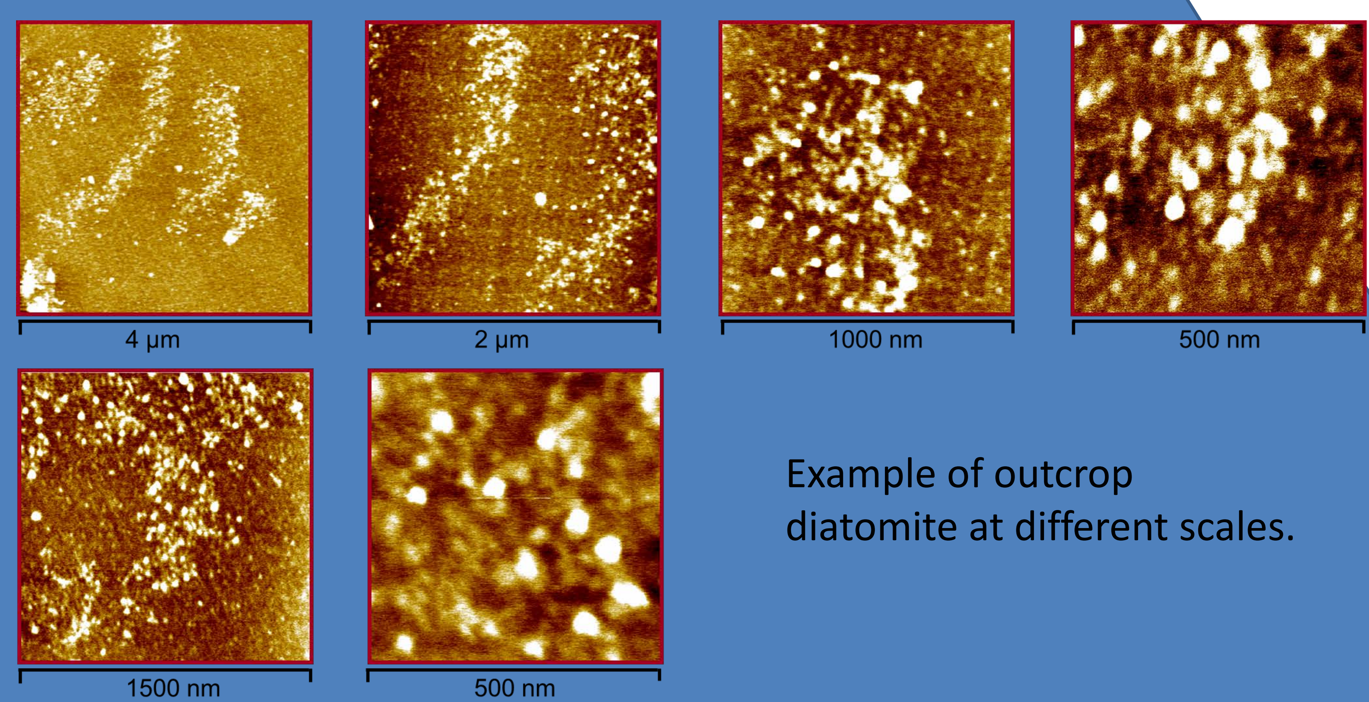
In both cases a key property is the mineral bulk modulus, K_{min}.

State of the art. Currently, the elastic modulus of minerals are largely guess-work except for the most common minerals as quartz and calcite. The aim of the project is to develop a procedure for estimating mineral moduli of minerals directly from polished sections. The procedure is using force mapping in an atomic force microscope for obtaining the elastic response combined with knowledge of the mineralogy from backscatter electron microscopy.

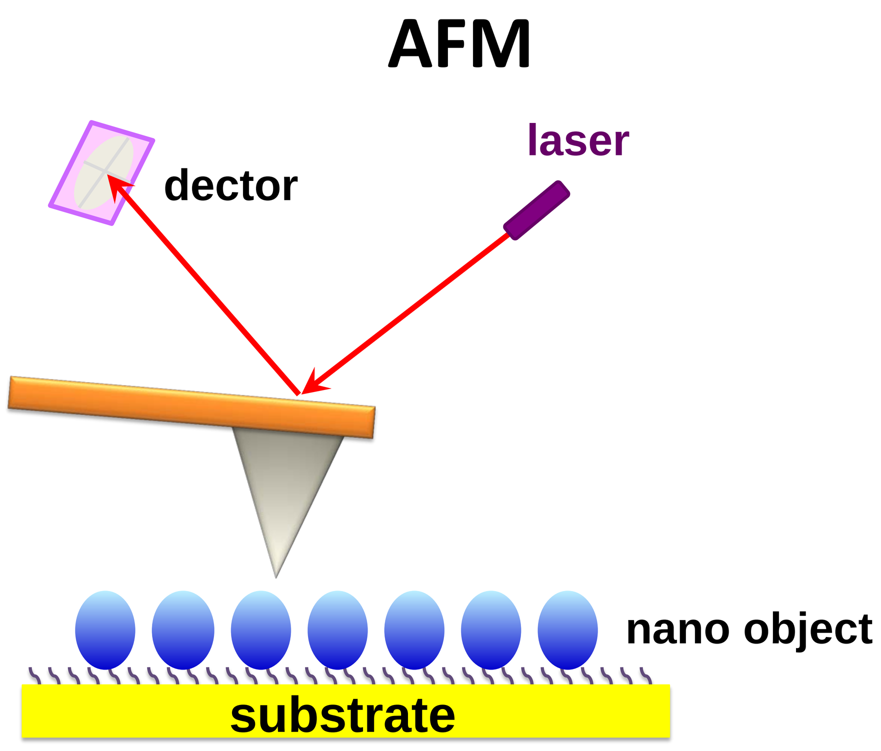
Atomic Force Microscope

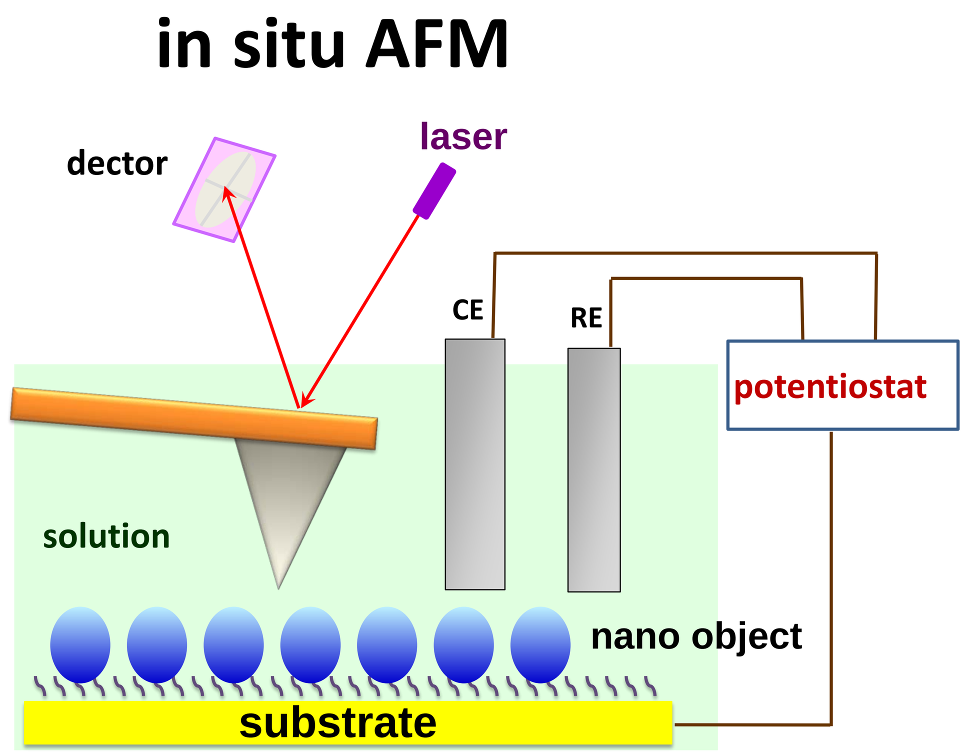


Example of a cleaned North Sea shale at different scales.

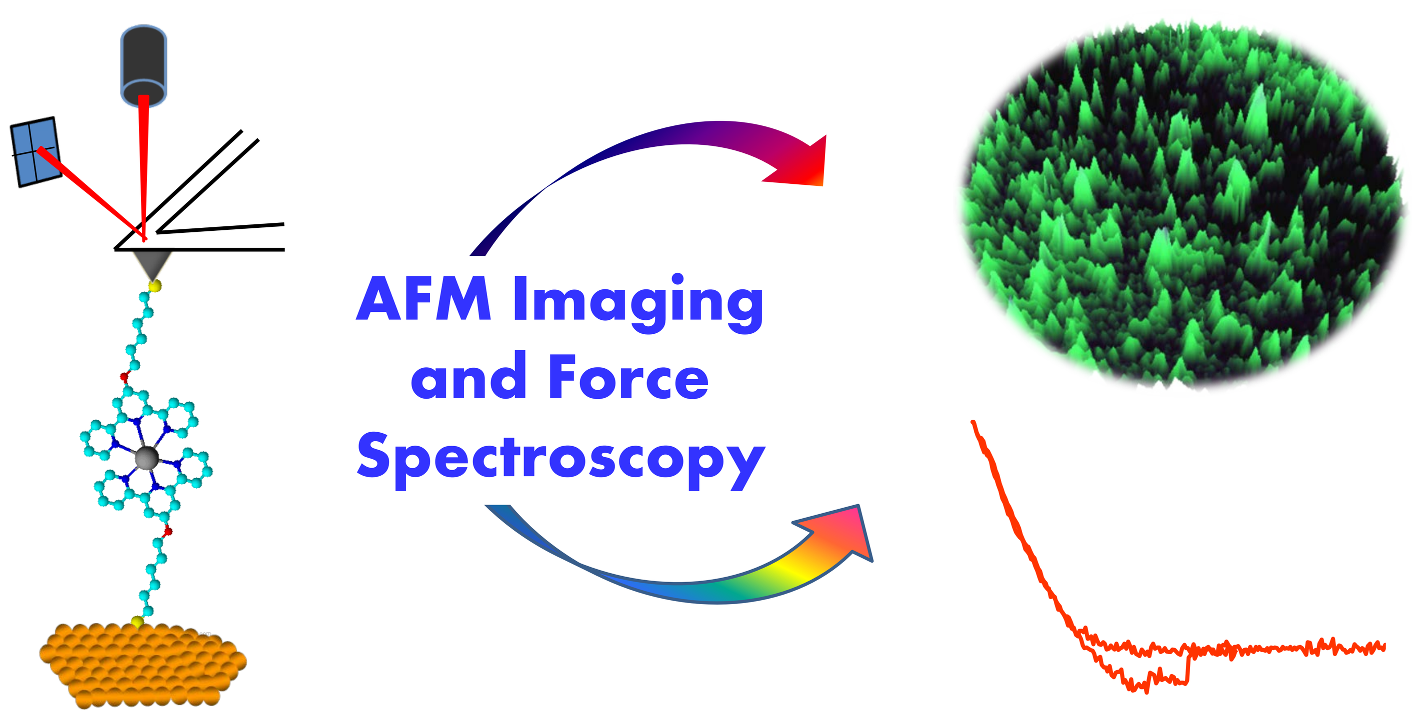


Example of outcrop diatomite at different scales.





Schematic illustration of AFM principles



Single-molecule Coordinative Forces