

Porosity Shrinkage

A value of [Effective porosity](#) change due to the rock compaction under [reservoir pressure](#) variation $p(\mathbf{r})$:

(1)
$$\delta\phi_e(\mathbf{r}, p) = \phi_{e0}(\mathbf{r}) \left(1 - \exp \left[\int_{p_i}^p c_r(p) dp \right] \right)$$

where

$c_r(p)$	pore compressibility (see also Pore compressibility @model)
p_i	initial formation pressure

Since the [pore compressibility](#) is very low ($\sim c_r = 0.5 \div 1.5 \text{ GPa}^{-1}$) for all [subsurface rocks](#) in [petroleum reservoirs](#) the (2) can be written as:

(2)
$$\delta\phi_e(\mathbf{r}, p) = \phi_{e0}(\mathbf{r}) \cdot c_r(p) (p - p_i)$$

See also

[Petroleum Industry](#) / [Upstream](#) / [Subsurface E&P Disciplines](#) / [Petrophysics \(PP\)](#) / [Volumetric Rock Model](#) / [Effective Porosity \(PHIE\)](#)