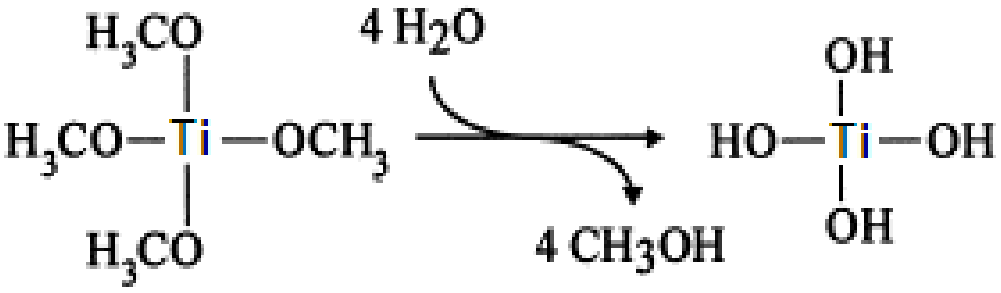
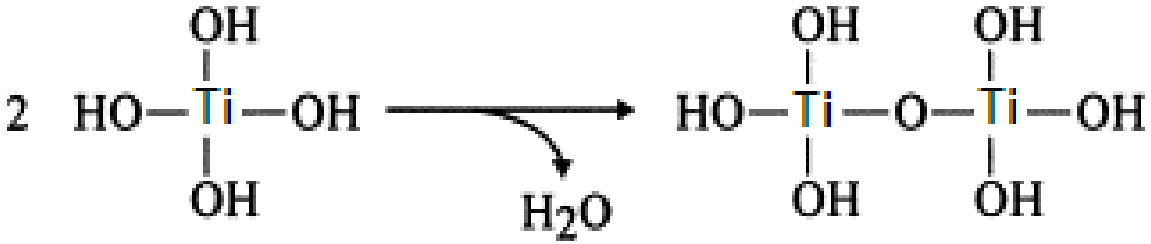
Processo Sol-Gel

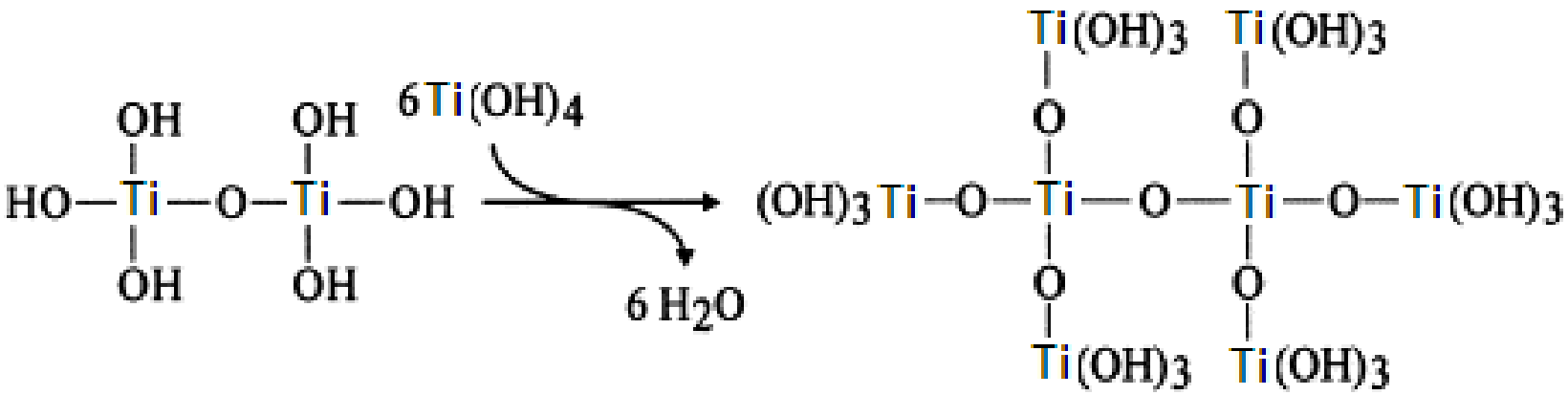
Il processo **sol-gel** costituisce uno dei principali metodi per la fabbricazione di materiali ceramici, tipicamente ossidi di metalli e semiconduttori. Il processo prevede la sintesi di soluzioni colloidali (*sol*, con dimensione delle particelle tra 1 nm e 1 μm) che costituiscono i precursori per la successiva formazione di un *gel* (reticolo fortemente interconnesso)

Precursori

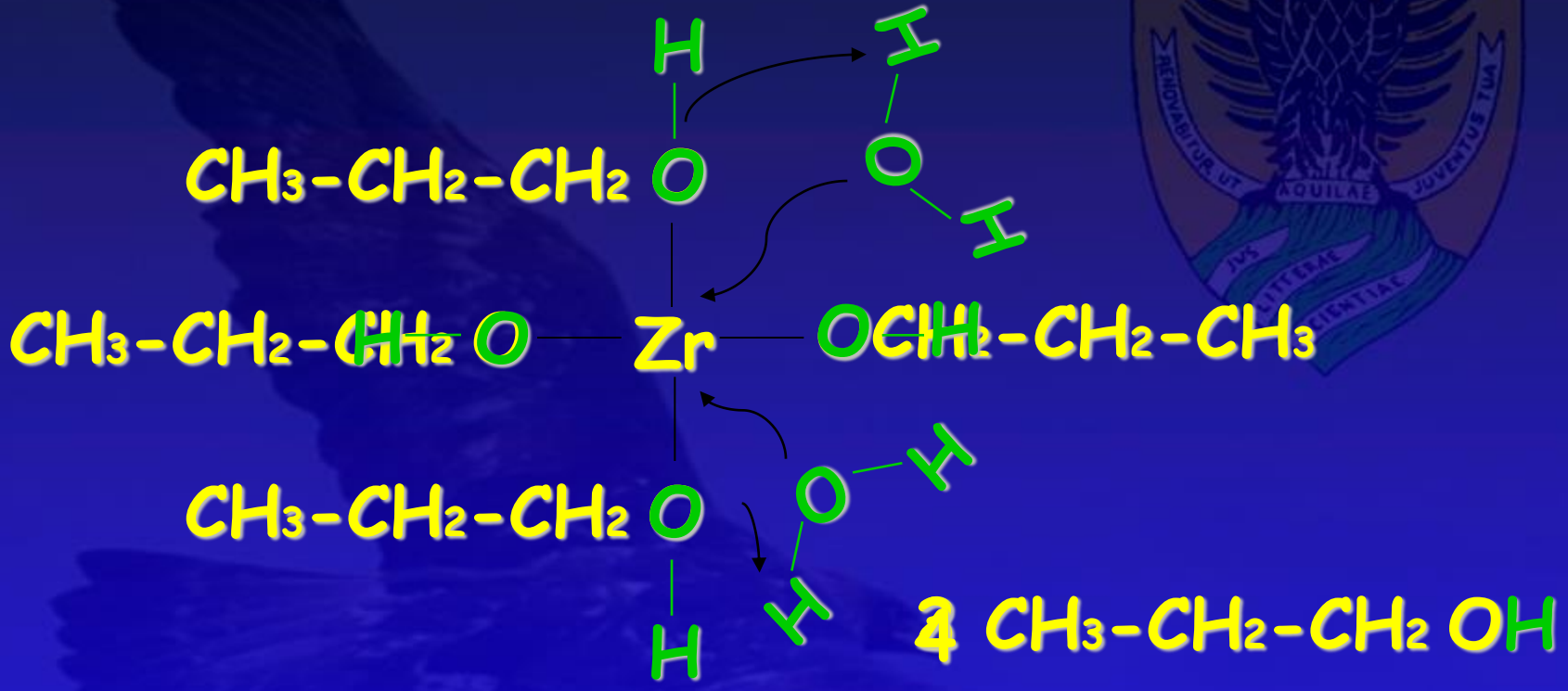
Precursore	MW	Bp(°C)	D(20°C) (g/ml)	
$Si(OCH_3)_4$ *Tetramethyl orthosilicate*	152.2	121	1.02	SiO_2
$Si(OC_2H_5)_4$ *Tetraethyl orthosilicate*	203.3	168	0.93	
$Ti(n\text{-}OC_4H_9)_4$ *Titanium(IV) butoxide*	284.3	170	1.03	TiO_2
$Zr(n\text{-}OC_3H_7)_4$ *Zirconium(IV) isopropoxide*	327.6	208	1.04	ZrO_2


H3CO
H3CO—Ti—OCH3
H3CO
4 H2O
4 CH3OH
OH
HO—Ti—OH
OH


2
HO—Ti—OH
OH
OH
H2O
HO—Ti—O—Ti—OH
OH
OH
OH
OH


HO—Ti—O—Ti—OH
OH
OH
OH
OH
6 Ti(OH)4
6 H2O
(OH)3Ti—O—Ti—O—Ti—O—Ti(OH)3
Ti(OH)3
Ti(OH)3
Ti(OH)3
Ti(OH)3
O
O
O
O

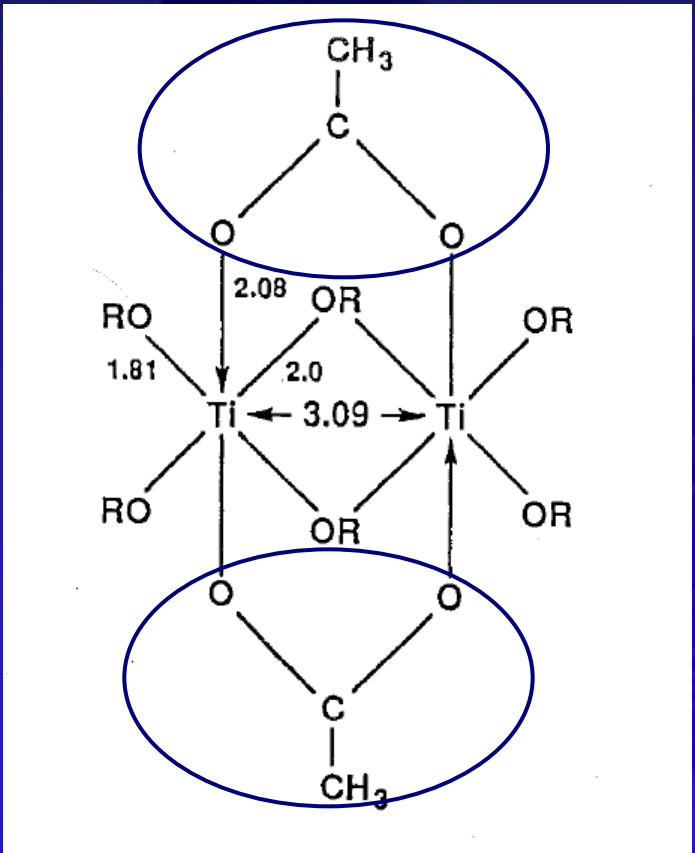
Precursori della Zirconia



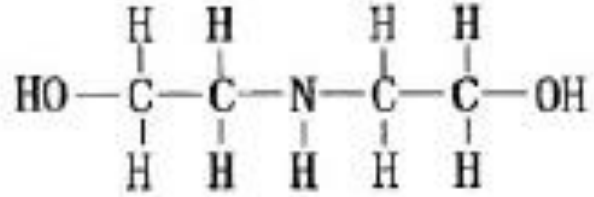
$Zr(n\text{-}OC_3H_7)_4$

Zirconium(IV) propoxide

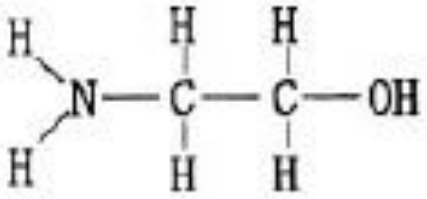
Stabilizzazione del Sol mediante agenti complessanti



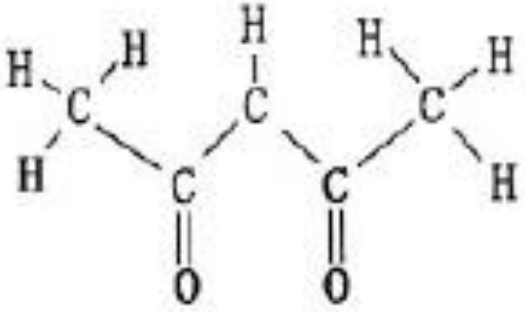
Acido acetico



Diethanolamine



Monoethanolamine



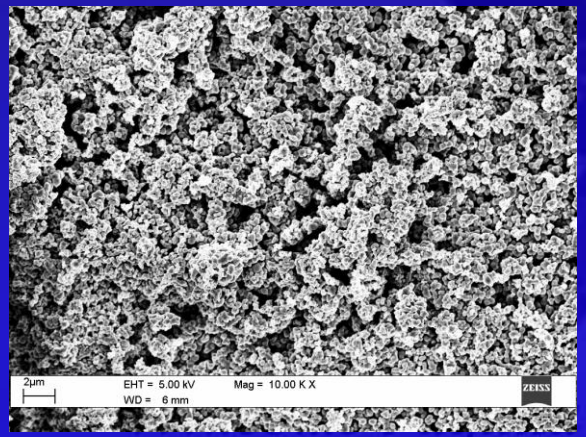
Acetylacetone

Ossidi nanostrutturati:

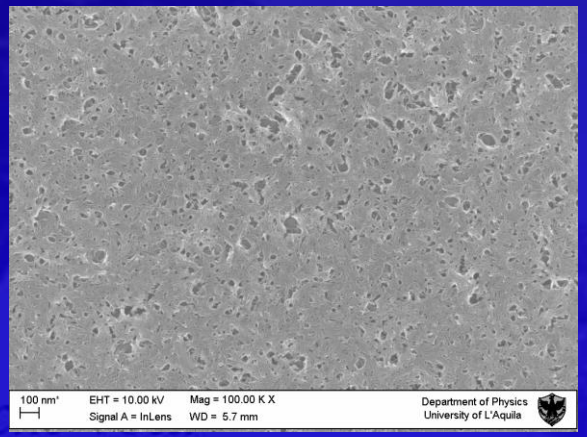
WO_3, ZnO, SiO_2, TiO_2,

Morfologie:

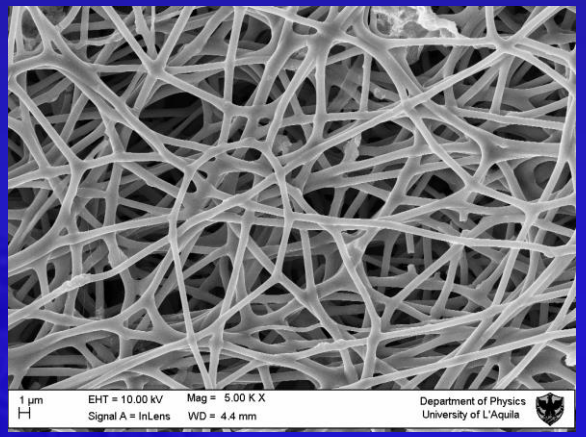
Nanoparticelle



Film sottili

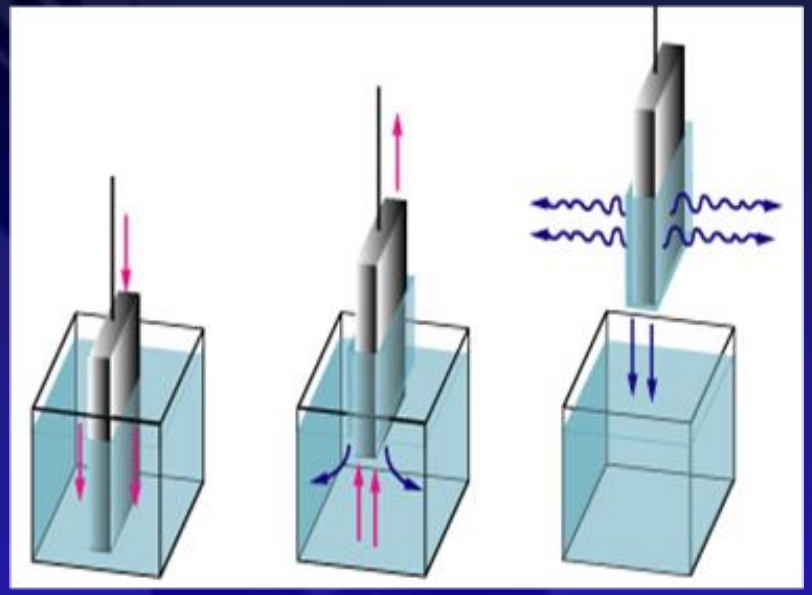


Nanofibre



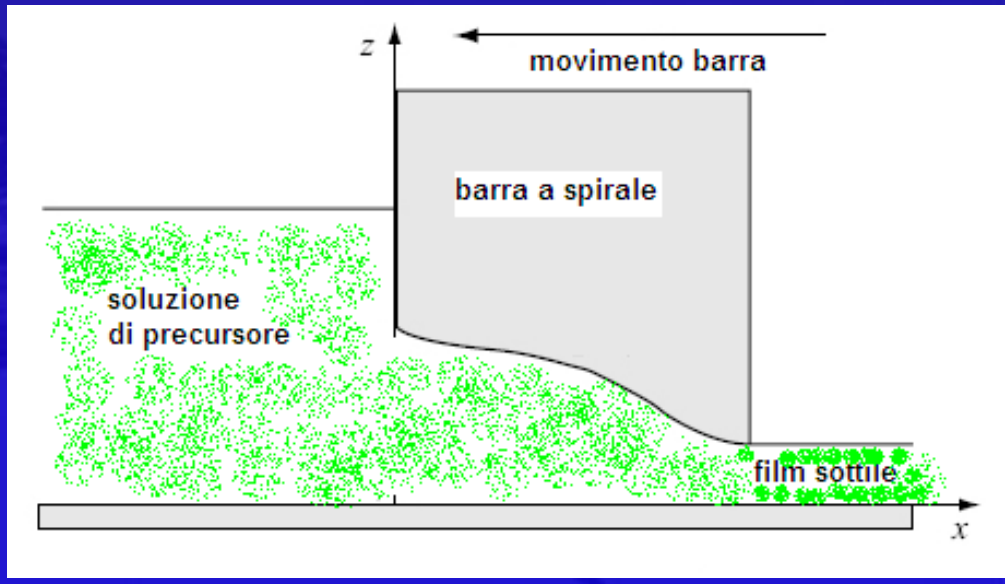
libera tra il cielo e i sassi. . .

Film



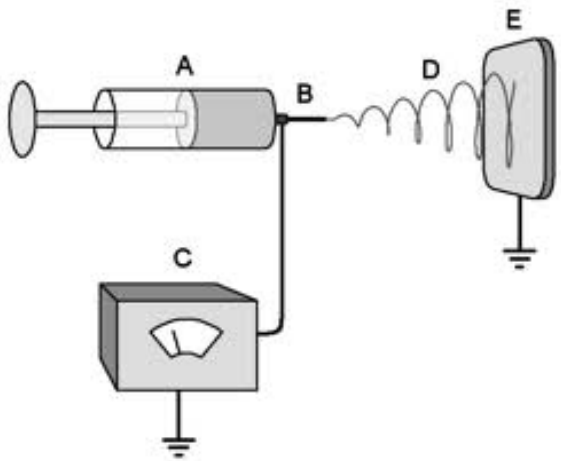
dip coating

spiral bar deposition

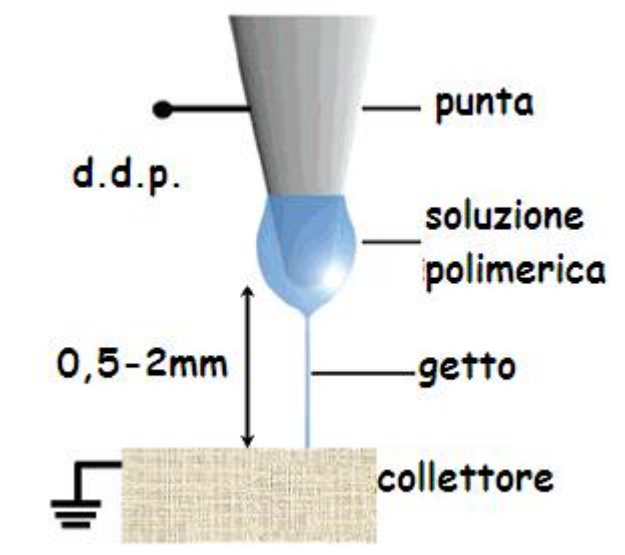


Nanofibre

elettrospinning



A: soluzione di polimero
B: ago
C: generatore di d.d.p.
D: getto di polimero
E: collettore



near field elettrospinning