Suppression of Crack Initiation of Metallic Materials by Using a Cavitating Jet

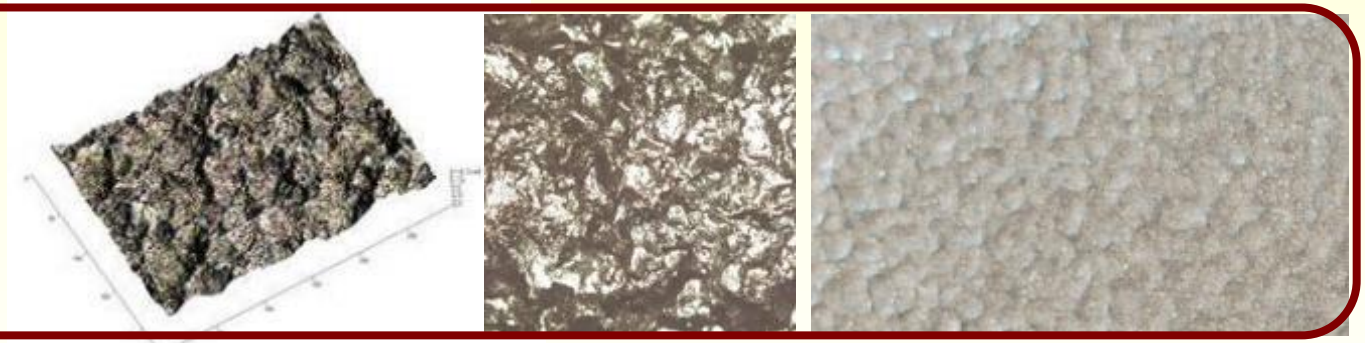
Hitoshi SOYAMA

Department of Nanomechanics, Tohoku University

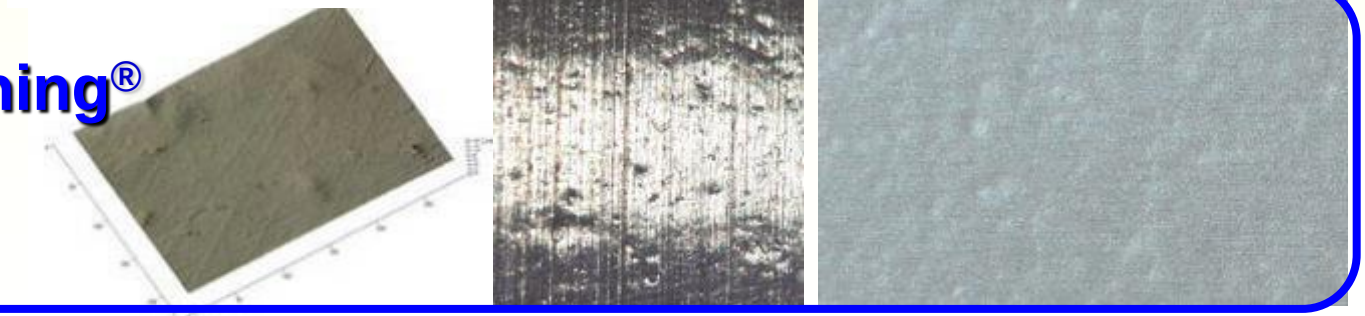
Cavitation S Peening®

Shotless **S**hock wave **S**mooth surface **S**OYAMA

Shot Peening
SP

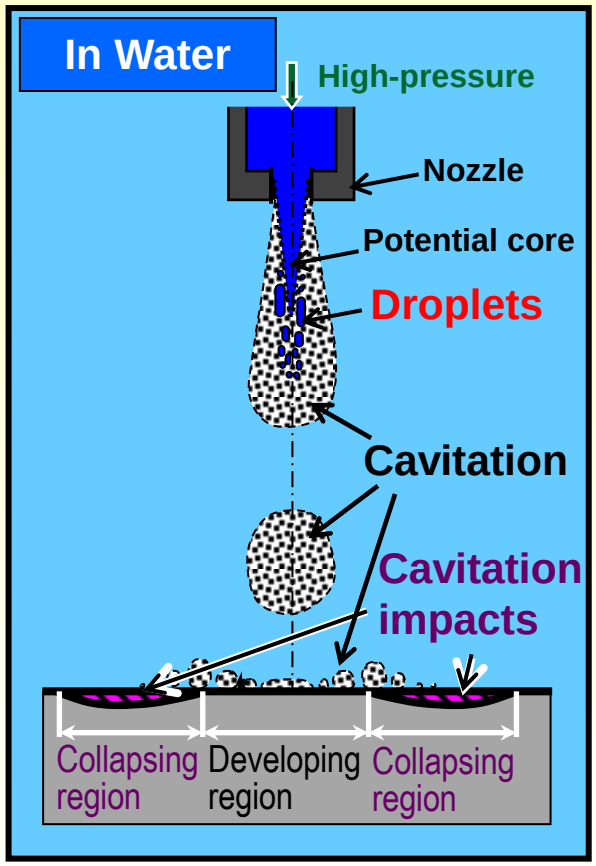


Cavitation S Peening®
CP



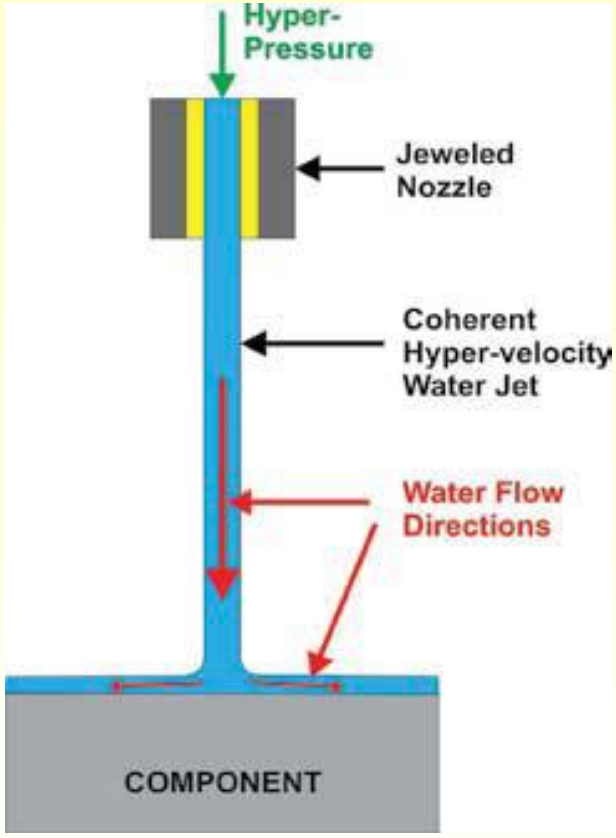
"Cavitation Peening" and "Water Jet Peening"

Cavitation impacts

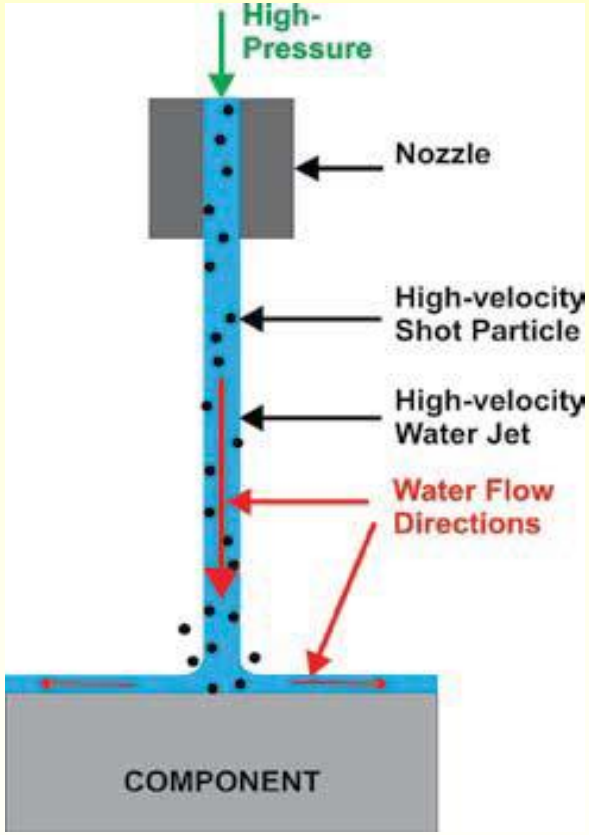


Cavitation Peening
(Cavitation Shotless Peening)

Droplet and/or shot impacts



Water Jet Peening



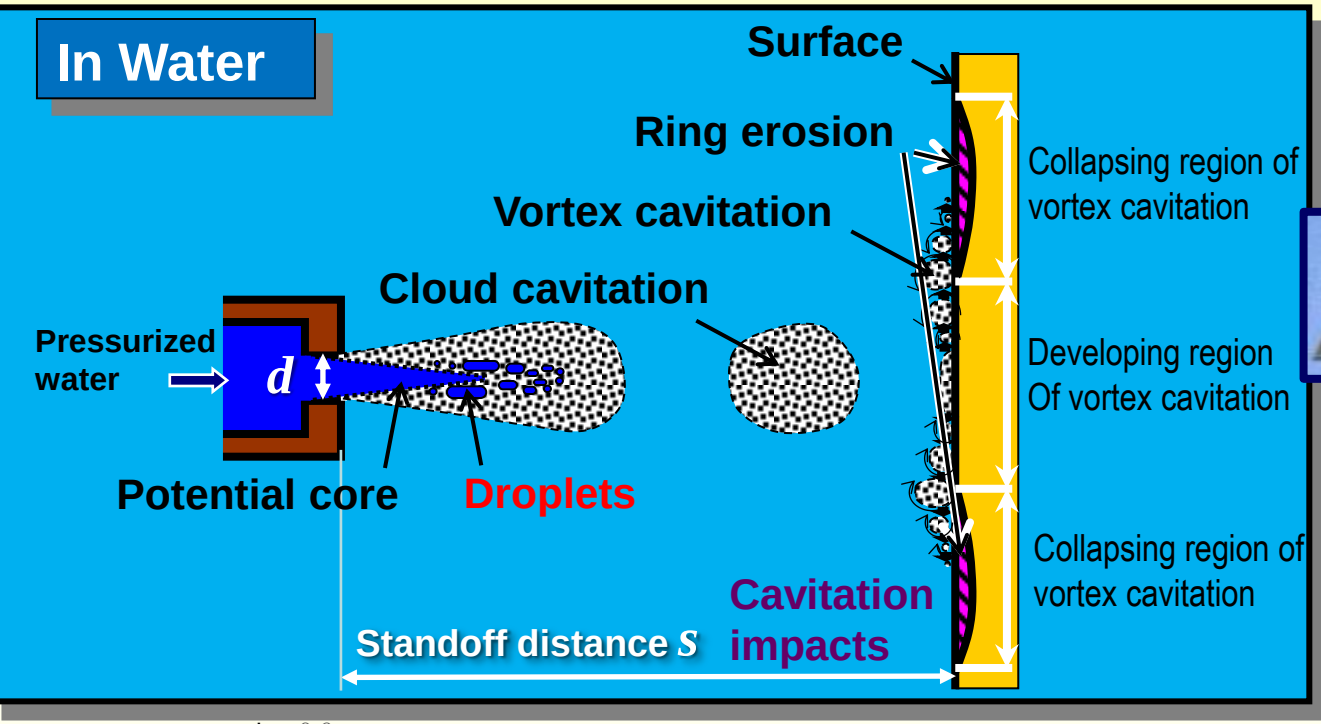
Water Jet Shot Peening

Schematic representation*

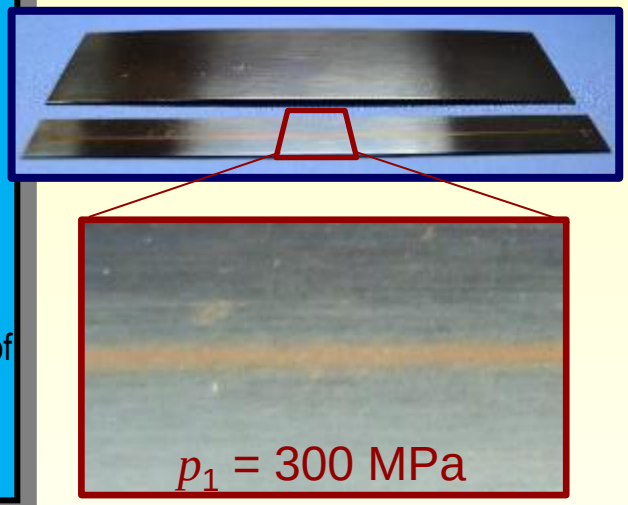
*H.Soyama, *The Shot Peener*, Vol. 28, No. 3 (2014), pp. 16-20.

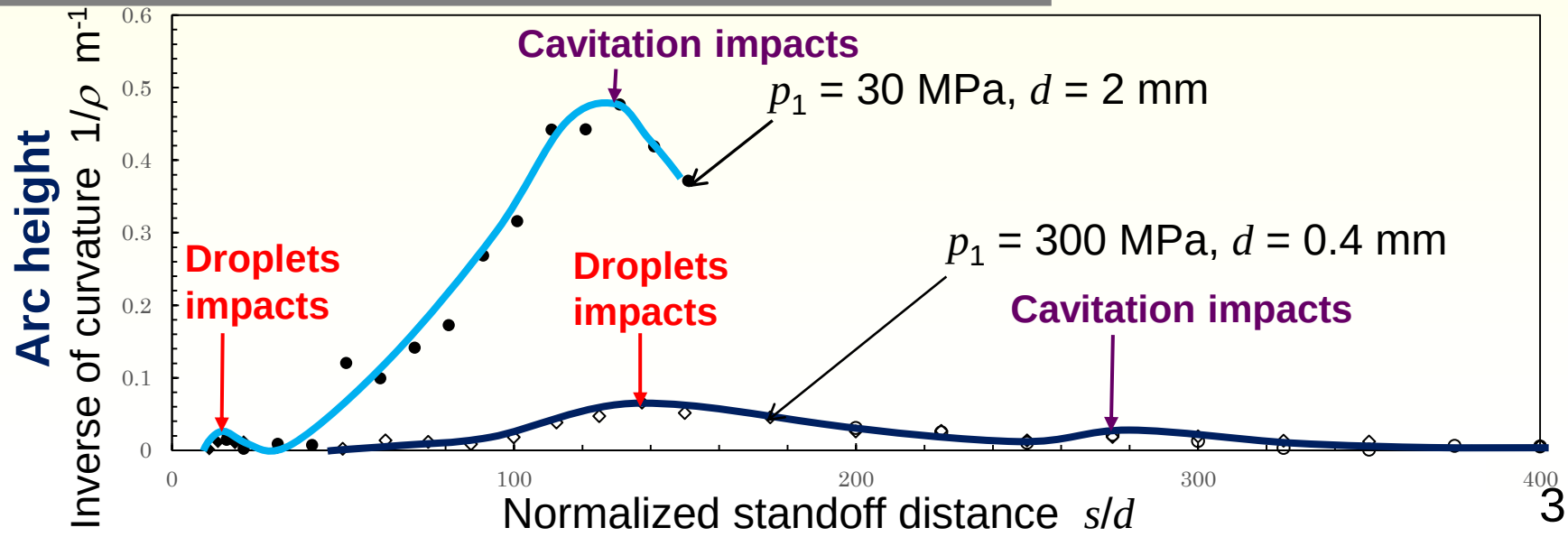
* D.Kirk, *The Shot Peener*, Vol. 28, No. 3 (2014), pp. 22-32.

“Cavitation Peening” and “Water Jet Peening”

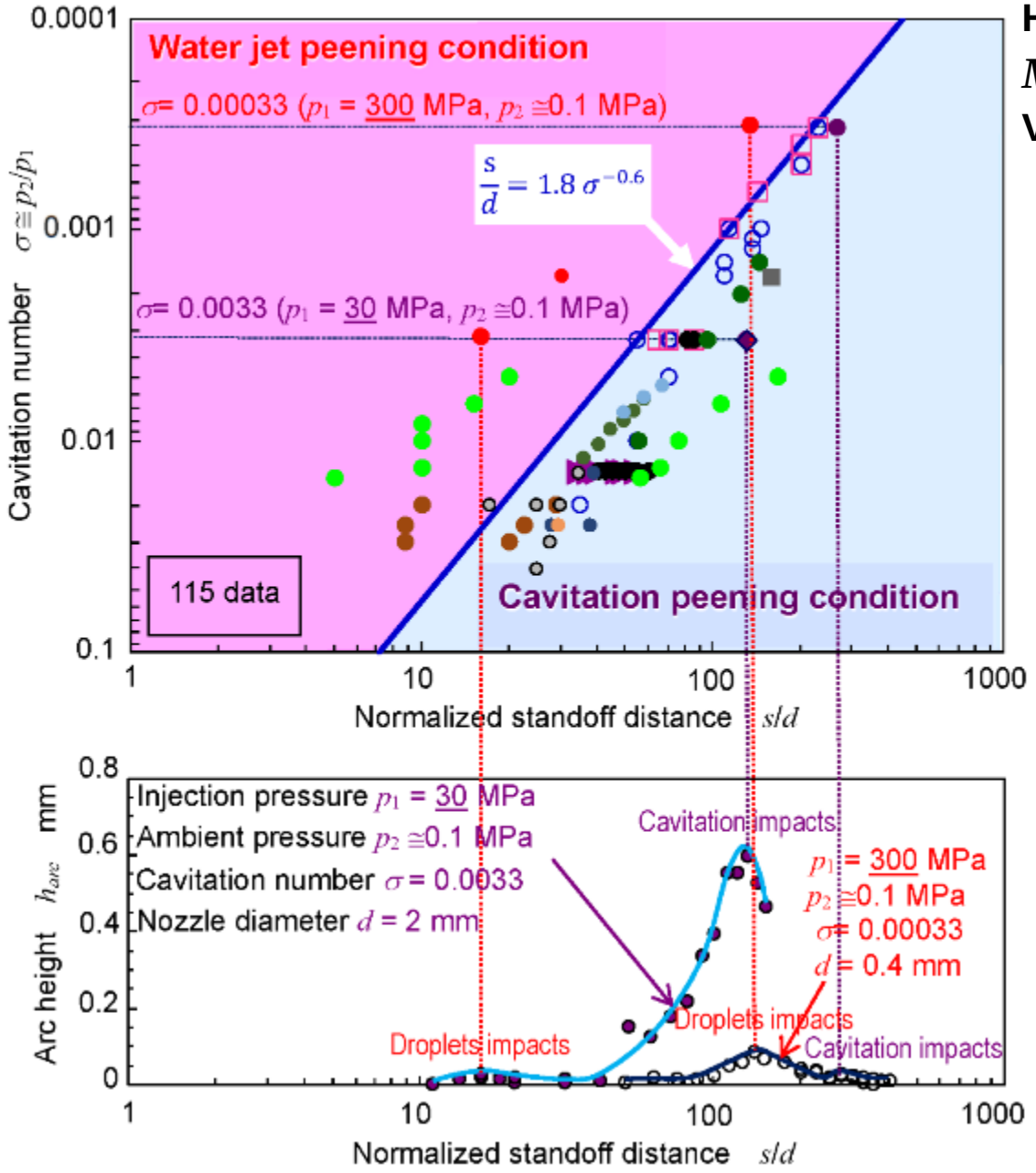


H.Soyama,
Mechanical Engineering Review,
Vol. 2, No. 1 Feb. 2015, in press.





“Cavitation Peening” and “Water Jet Peening”



H.Soyama,
Mechanical Engineering Review,
Vol. 2, No. 1 Feb. 2015, in press.

$$\frac{s_{opt}}{d} < 1.8\,\sigma^{-0.6}$$

Water Jet Peening

$$\frac{s_{opt}}{d} \geqq 1.8\,\sigma^{-0.6}$$

Cavitation Peening

Cavitation number : σ

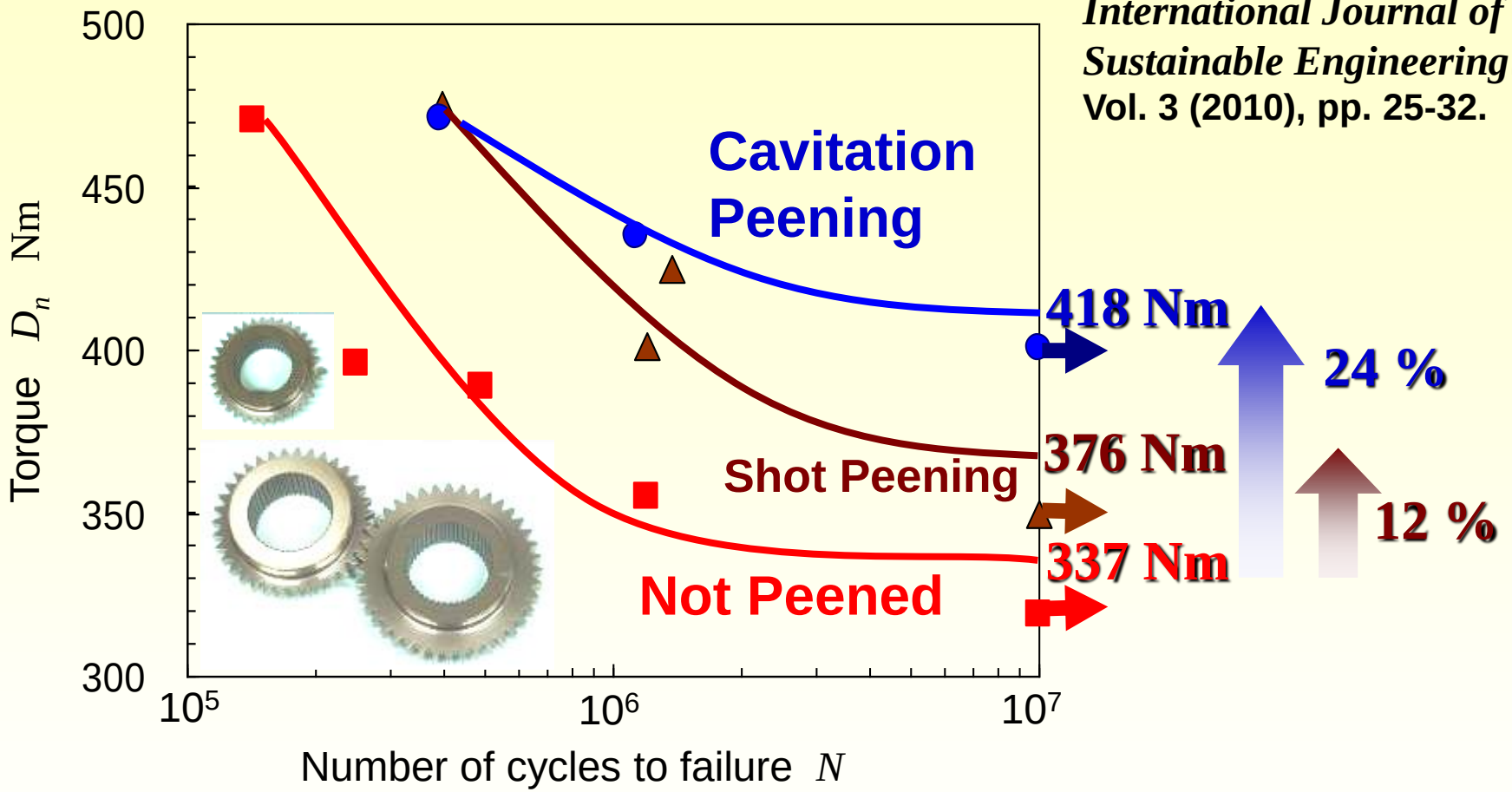
$$\sigma = \frac{p_2 - p_v}{p_1 - p_2} \cong \frac{p_2}{p_1}$$

Injection pressure of the jet : p_1
Down stream pressure of nozzle : p_2
Vapor pressure : p_v

Improvement of Fatigue Strength of Gear

Joint Project with HONDA

H.Soyama and Y.Sekine, *International Journal of Sustainable Engineering*, Vol. 3 (2010), pp. 25-32.

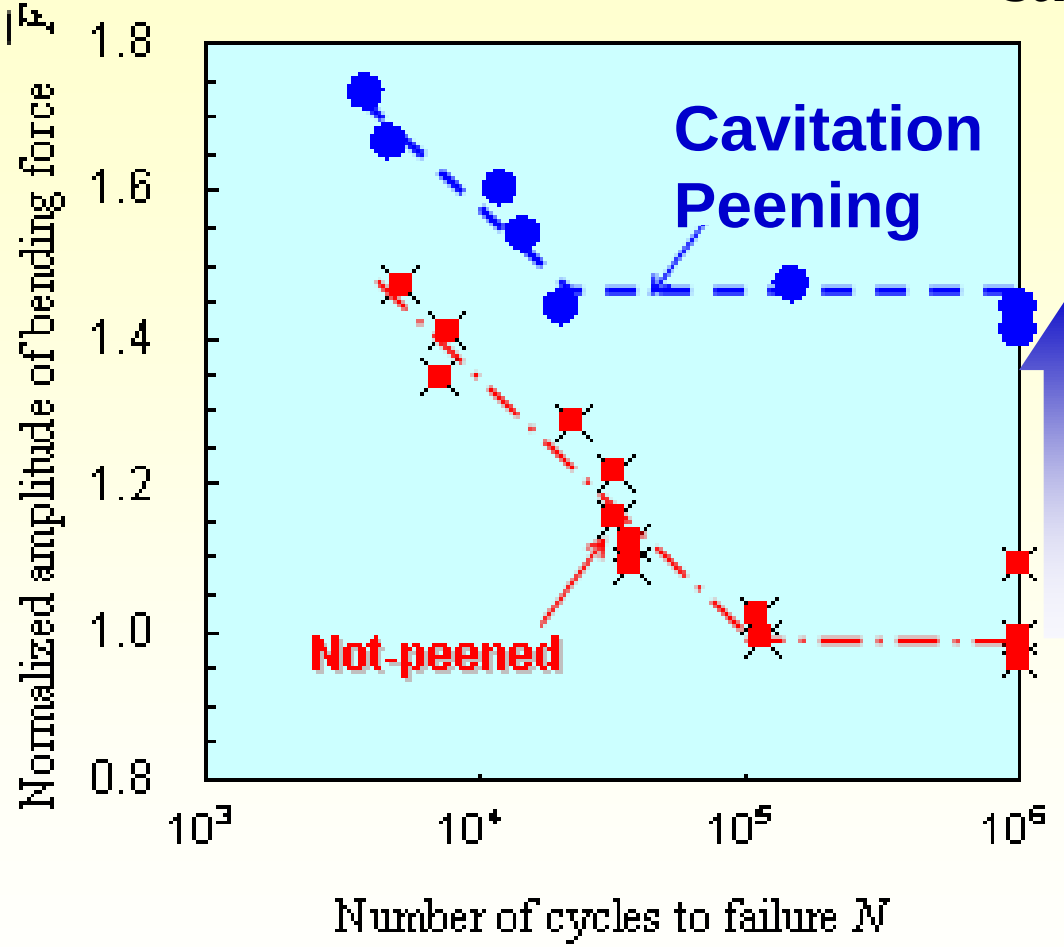


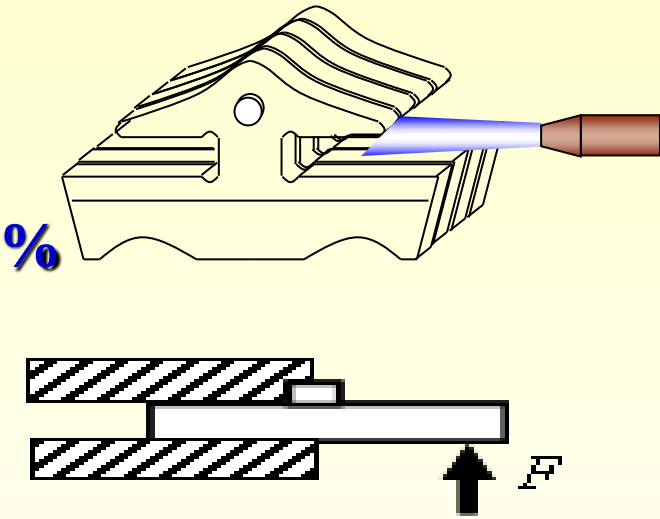
Improvement of fatigue strength of gear demonstrated using a power circulating type gear tester (Carburized SCM420H)

Improvement of Fatigue Strength of CVT Elements

Joint Project with TOYOTA

H.Soyama et al., *Journal of Materials Science*, Vol. 43 (2008), pp. 5028-5030.

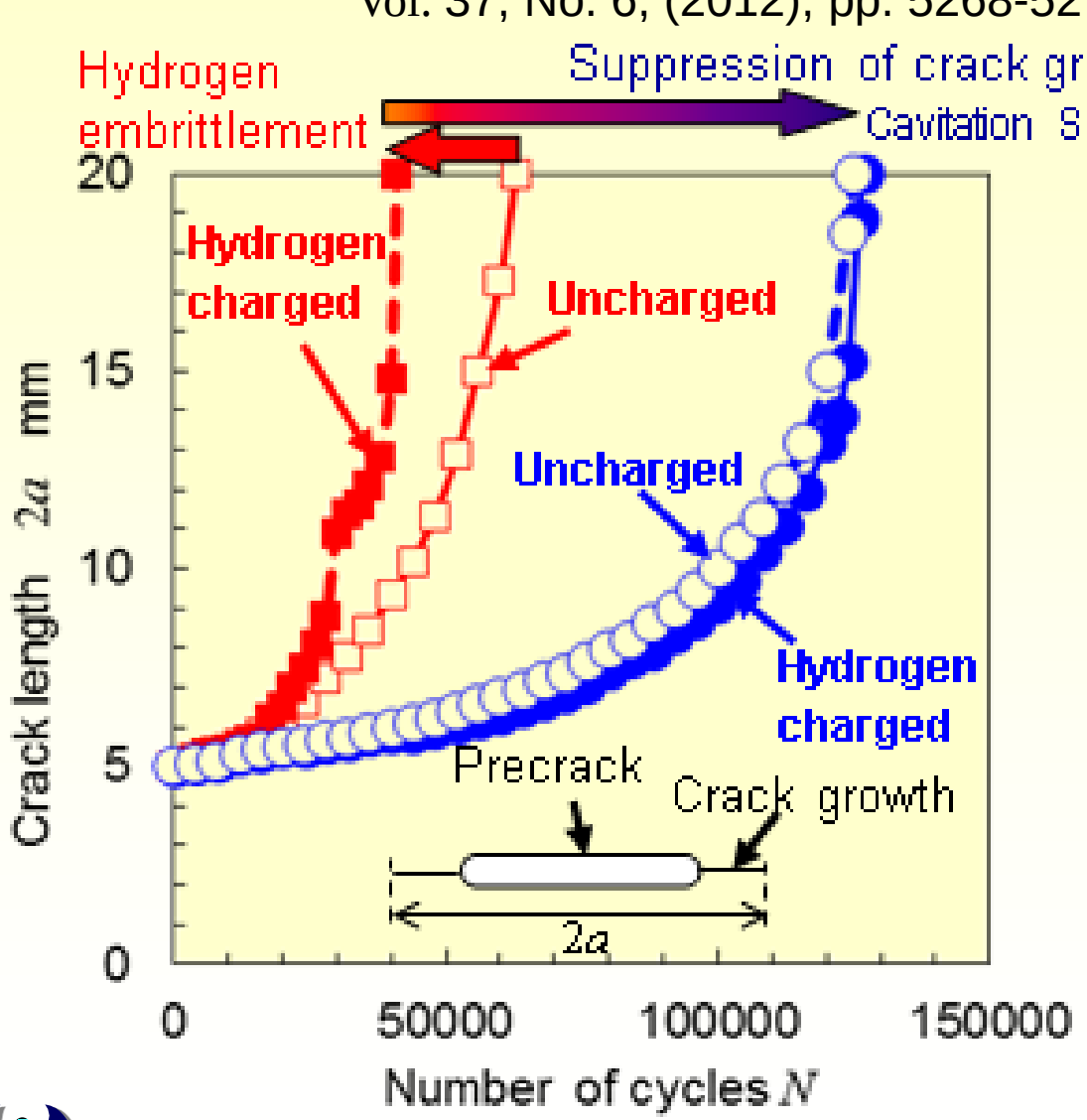


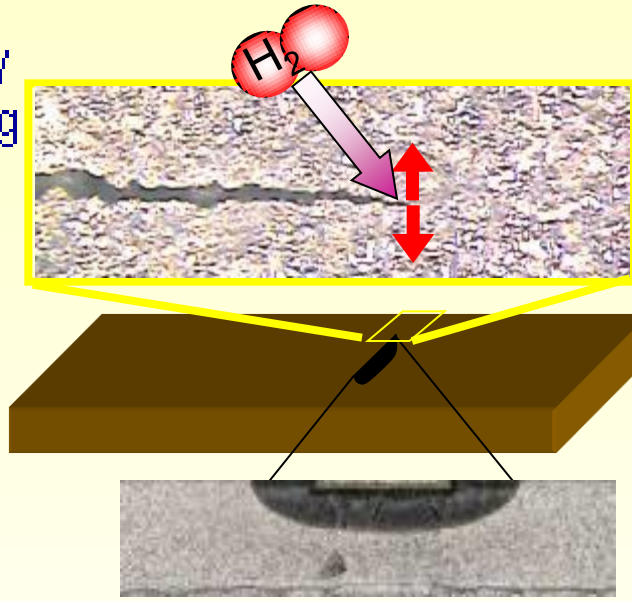


Improvement of fatigue strength of elements of steel belt for CVT

Suppression of Hydrogen Embrittlement

O.Takakuwa and H.Soyama, ***International Journal of Hydrogen Energy,*** Vol. 37, No. 6, (2012), pp. 5268-5276.





Unstable crack growth

Not treated

Stable crack growth

Cavitation Peening

Thank you for your kind attentions