

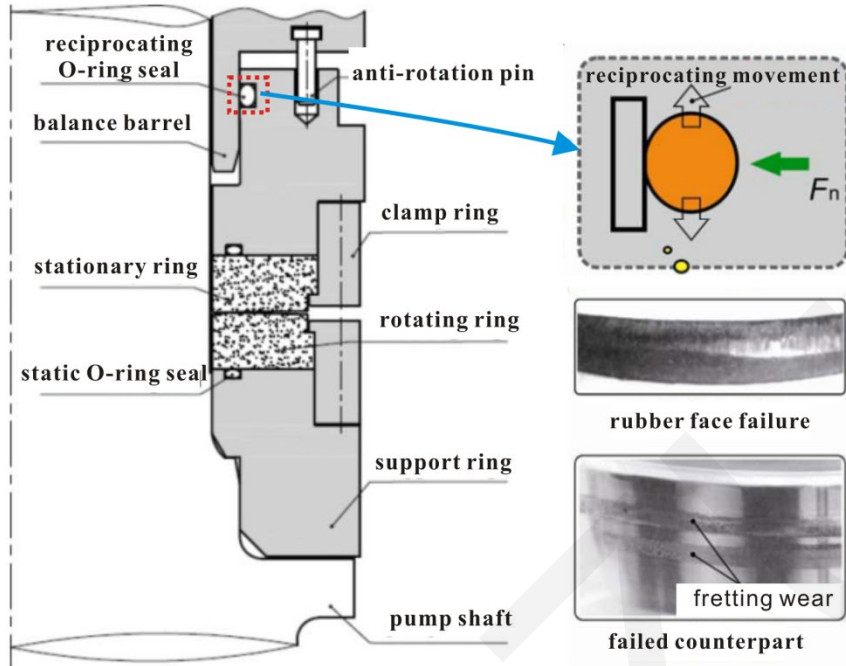
# Influence of $\text{Al}_2\text{O}_3$ particles on the friction and wear behaviors of nitrile rubber against 316L stainless steel

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# Background

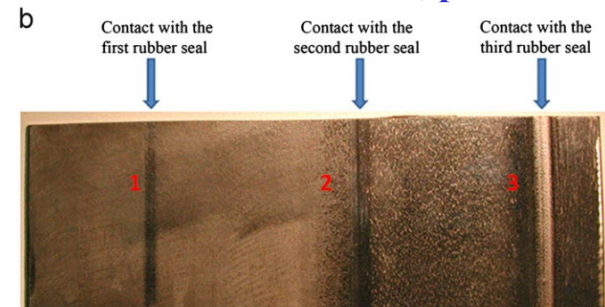
- **Nitrile rubber (NBR) has a wide range of applications.**



- Schematic diagram of the primary seal of the hydrostatic mechanical seal in RCPs



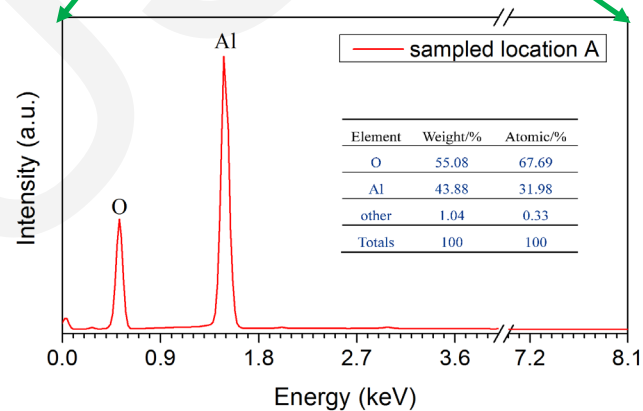
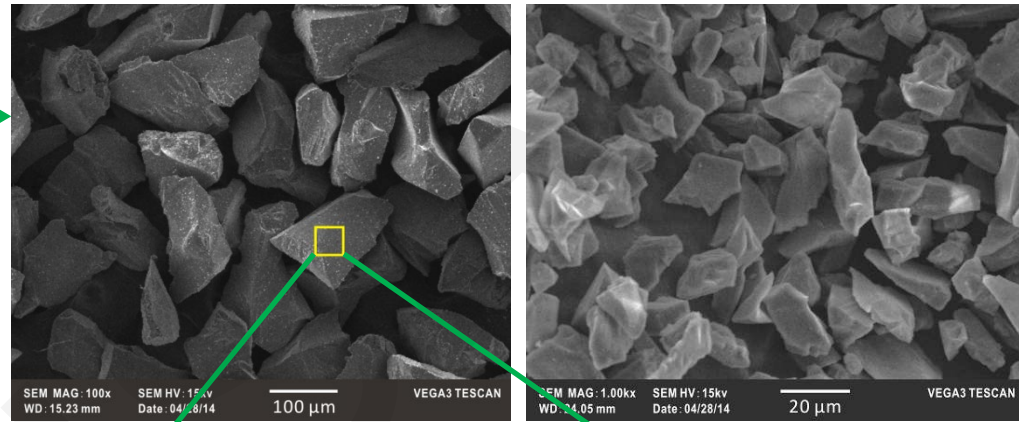
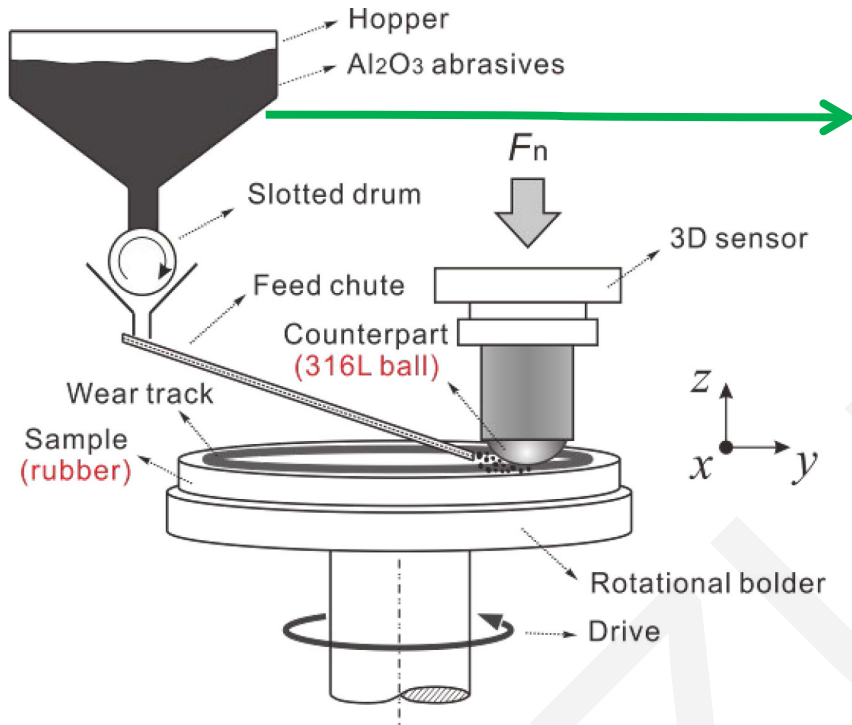
- A, rubber seals;
- B, Stellite lip-seal;
- C, pressurised oil;
- D, pressurised grease



- The tunnel boring machine (TBM)---lip-seal zone

- ❑ As the most common pairs in seal components, **rubber/metal tribo-pairs** are widely used in compressors, plunger pumps, etc;
- ❑ The influence of **hard particles** on the damage behaviors of contact pairs as well as its wear mechanism has remained unclear.

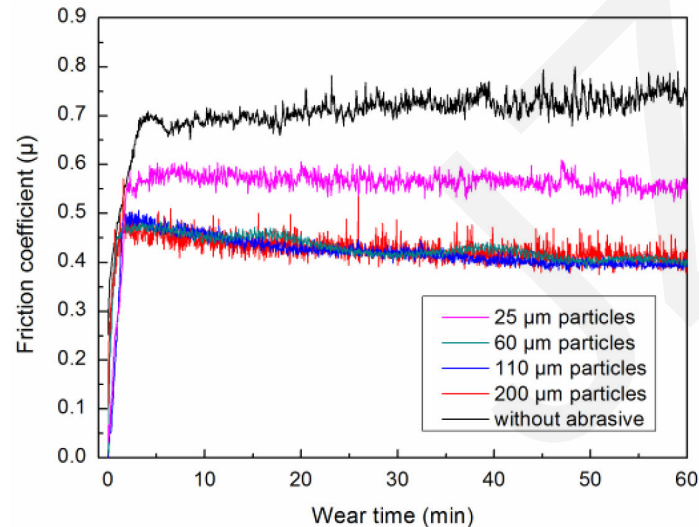
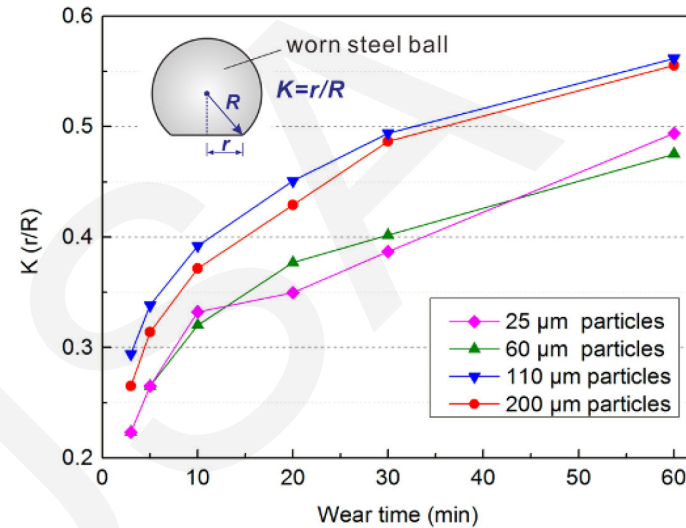
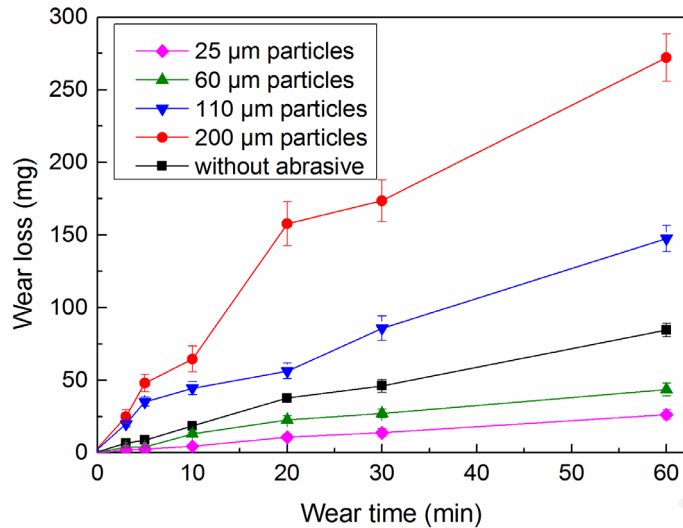
# Materials & Methods



- Schematic illustration of the tribological tester with a sphere-on-disc contact

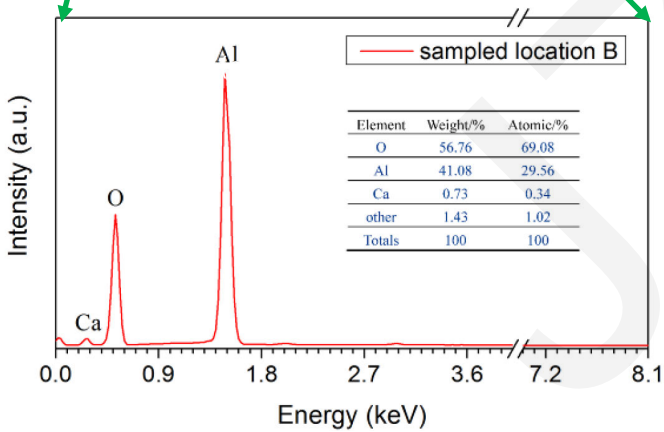
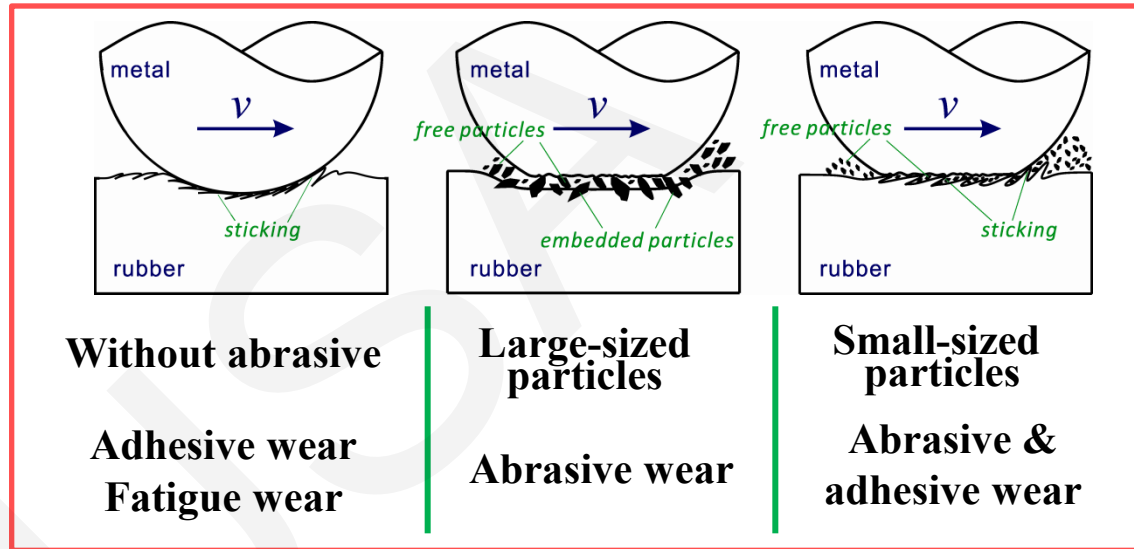
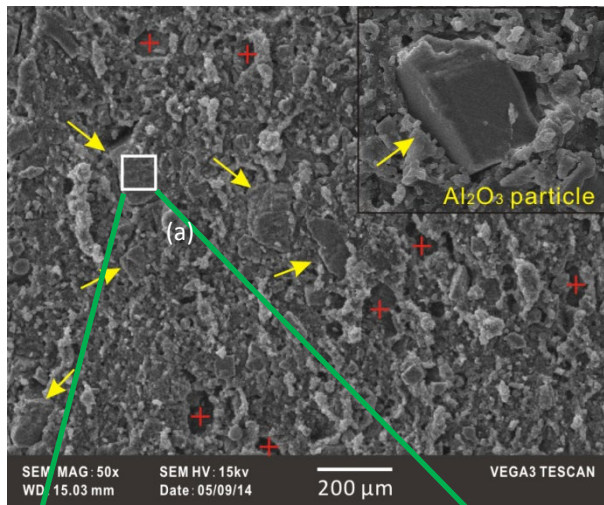
Material	$\sigma_s$ (MPa)	$\sigma_b$ (MPa)	Elongation (%)	$E$ (GPa)	Density (g/cm <sup>3</sup> )	Hardness
316L	310	580	-	205	7.98	180 Hv
NBR	-	16.8	≥450	0.0116	1.32	72 Shore A

# Major Results



- The size of the  $\text{Al}_2\text{O}_3$  particles had a great influence on the wear of NBR and metal counterpart;
- The friction coefficients, with and with no particles of different sizes, showed significantly different tendencies.

# Major Results



➤ The nitrile rubber/ 316L stainless steel friction pair with and with no  $Al_2O_3$  particles showed different wear mechanisms.

# Conclusions

- $\text{Al}_2\text{O}_3$  particles greatly influenced the friction and wear properties of NBR/stainless steel tribo-pairs;
- The damage behaviors of NBR and stainless steel counterpart were different under varied normal loads;
- The NBR/stainless steel tribo-pairs presented different wear mechanisms under no particle conditions and with the different sizes of the particles.