

“DLC (Diamond-Like Carbon)”

Used in “Aim for Gold Medal in 2018 Pyeongchang Paralympics” (page 54)

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1 What is DLC?

DLC (Diamond-Like Carbon) is a general term for hard amorphous carbon film. It is an extremely thin black film with a thickness usually about 1 μm . As the name indicates, the film has a mixing structure of extremely hard diamond and graphite used for pencil lead (Fig. 1). The properties of the film change depending on the mixing ratio and there are many variations of DLC with a different content of hydrogen or metal.

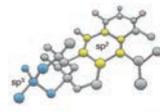
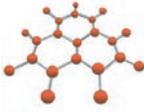
	Diamond	DLC	Graphite
Structure	 Diamond structure 	 Amorphous (diamond/graphite) structure Types of typical DLC • a-C:H (ordinary, containing hydrogen) • ta-C (hard, without hydrogen) • a-C:H (Me) (containing metal)	 Graphite structure 

Fig. 1 Structure of DLC

2 Features of DLC

DLC is a low-friction film. If it slides against steel, the friction coefficient is about half of that of nitrocarburizing or Cr plating (Fig. 2). The wear amount of DLC is less than one fiftieth of that of nitrocarburizing (Fig. 3) and the seizure load of DLC is more than twice that of nitrocarburizing (Fig. 4). Thus, DLC has a great advantage in sliding property. There is no other surface treatment that has this distinguished property.

3 Application examples at KYB

Taking advantage of the low friction property, DLC is

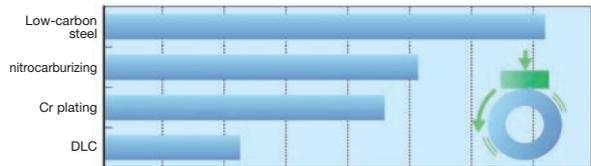


Fig. 2 Friction coefficient of various surface treatments

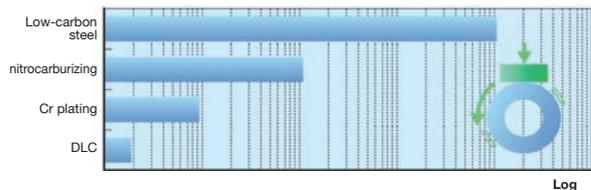


Fig. 3 Wear volume of various surface treatments

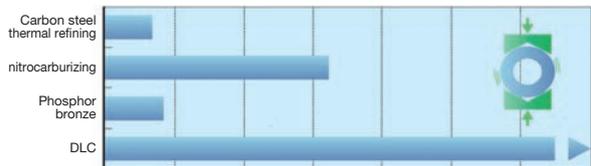


Fig. 4 Seizure load of various surface treatments

used for the inner tubes of motorcycles and piston rods of passenger cars. Taking advantage of the high wear-resistance property, DLC is used for swash plate control pins for piston pumps (Fig. 5).

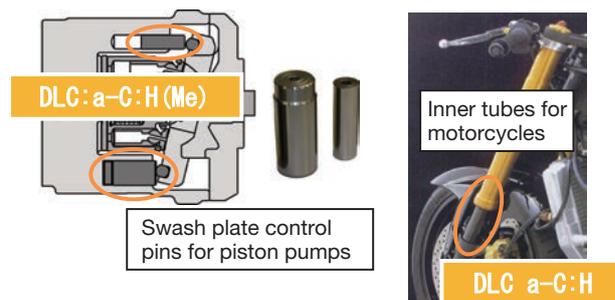


Fig. 5 Applications of DLC at KYB