



NGK Spark Plugs (U.S.A.), Inc. – Aftermarket Division
46929 Magellan Drive - Wixom, Michigan 48393

Platinum, Iridium, Protons and Electrons

Today there are many choices and options when selecting a spark plug for your vehicle. Most spark plug companies offer several different plug styles in varying ranges of perceived cost and quality. But which is right for your vehicle? The plug you choose must be compatible with your ignition system.

Automotive ignition systems have come a long way from the points and condenser or even cap and rotor days of old. Today's vehicles feature high power ignition systems including Distributorless Ignition Systems (DIS) and Coil on Plug (COP) designs. Sure, the modern ignition systems are more reliable and outperform previous designs, but what about the spark plugs? You may have noticed from your vehicle's maintenance schedule spark plug replacement is not necessary for anywhere between 80,000 to 100,000 miles or more. How can a spark plug last so long? The answer is precious metals.

Most new vehicles are supplied from the factory with long life dual precious metal spark plugs using Platinum or Iridium center firing electrodes combined with Platinum welded to the ground electrode. The strength and density of these metals greatly reduces spark plug gap erosion. When a vehicle manufacturer specifies a spark plug gap, the goal is to have the spark plug stay at that recommended gap for as long as possible. If the spark plug gap expands excessively, fuel consumption will increase, more pollution is created, and engine performance will suffer.

The first vehicles to make use of long life double precious metal spark plugs were those using the Distributor less Ignition System (DIS). The DIS system eliminates the need for a distributor, distributor cap, and rotor. Many of these ignition systems still make use of spark plug wires. The wires run from the coil packs to the spark plugs. With this design a V8 engine will have 4 coils, a V6 will have 3 coils, and a 4 cylinder engine will have 2 coils. Each coil is responsible for providing the power to two spark plugs. The coil provides the spark for one of the paired cylinders on the compression stroke, and to the other on the exhaust stroke. Because the coil fires the spark plug on the exhaust stroke as well, this ignition system is also referred to as "Wasted Spark Ignition." In effect, the spark plugs now fire twice as often as in previous ignition systems. Because the plugs are firing twice as often, the need for longer wearing materials arose.



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The DIS system fires two plugs simultaneously. One of the two paired spark plugs is always negative polarity while the other spark plug is always positive polarity. Negative polarity means the spark plug's center electrode is negatively charged and its ground electrode is positively charged. Positive polarity is the opposite. Each time the spark plug fires, there is a rapid exchange of protons (+) and electrons (-). This exchange is called ionization. Because opposites attract, the protons are attracted to and collide with whichever of the electrodes that is negatively charged.

The negatively charged electrons will be attracted to whichever side of the spark plug that is positively charged. The positively charged protons have much more mass than electrons, and thus cause more wear on the electrode they collide with. A spark plug on the positive polarity side of the DIS coil will have a positive (+) center electrode and a negative (-) ground electrode. Here, more wear will be exhibited at the ground electrode. A spark plug connected to the negative polarity side of the DIS coil will have a negative (-) center electrode and a positive (+) ground electrode. In this case, much of the wear will be exhibited on the center electrode. If a spark plug with an enhanced material only on the center electrode (i.e. Single Platinum, Single Iridium) were to be used on this type of ignition system, there would be uneven wear on half of the plugs. Although single precious metal or standard nickel alloy spark plug designs will still allow an engine to run, the service life of the spark plug is greatly reduced.

Another ignition system found on many new vehicles is the Coil on Plug Ignition (COP). In this system, each cylinder has its own coil directly over the spark plug, eliminating the spark plug wires. Each coil fires independently, firing only one spark plug on the compression stroke. Since the plugs fire only when needed to ignite the combustion chamber, wear is reduced. In a COP design, all spark plugs are usually the same polarity. The spark plugs are typically negative polarity (-) meaning the majority of wear will occur when the positively (+) charged protons collide with the negatively (-) charged center electrode. Most manufacturers using this type of ignition system still rely on dual precious metal spark plugs for maximum longevity, high ignitability, and reduced emissions.

In summary, vehicle manufacturers design new engines to meet increasingly strict performance and emissions requirements. If a vehicle was originally equipped with dual precious metal spark plugs, replacement with single precious metal or standard nickel alloy spark plugs may reduce spark plug service life and engine performance. To guarantee the best performance, reliability, and longevity, it is recommended to replace dual precious metal spark plugs with those offering the same form, fit and function as the originally equipped spark plugs.