Coated Graphite Electrodes

Details:

Graphite electrodes are used mainly in electric arc furnace steel production. Furthermore, coatings has been used on **graphite electrodes** since 1969 in these industries for steel melting, ranging from 5 tonnes to 185 tonnes capacity, using 200 ~ 600 mm diameter electrodes. Graphite electrodes are used for producing STEEL.

The coating has two main functions :

- To protect the surface of the electrode while use in the furnace from oxidation. While the oxidation occurs, the diameter of the electrode tip remains larger than that on an uncoated electrode. The linear rate of wear of the electrode is also decreased so that the overall electrode consumption is reduced.

- To form high conductivity, low resistivity skin which increase the current carrying capacity of the electrode. This allows more current to pass through the same sized electrode, avoiding severe mechanical damage.




The best way to perceive the effect of coating is when coated and uncoated electrodes are mixed on the same electrode column.

Specifications:

KANDI sophisticated Coating gives excellent antioxidation properties to graphite electrodes and reduces the specific consumption of graphite considerably. Coated electrodes are used for the production of electric steel as well as for manufacturing non-metallic products in electric arc processing.

The protective coating consists of several layers and is added to the electrode surface in a complicated, multilevel production process. A special characteristic of the coating technology is the electric arc treatment of every single layer. Indicative coating details :-

Parameter	Unit	Value
Thickness of the Coating	mm	0,5 – 0,8
Specific Electrical Resistivity	Ω.µm	0,07 – 0,10
Gas impermeability at 900° C	h	above 50
Temperature when Decomposition Process starts	°C	above 1850
Delay of Graphite Surface Oxidation	h	10 – 20

Coating consists of 3 layers serving separate function. The first layer produces a high temperature, oxidation resistant coating, which forms the major protection of the electrode. Above this layer, a sprayed coat helps to nullify any porosity of the previous coating layer. The final layer is mainly responsible for the increase in conductivity. The coating withstands temperatures over 1850 deg C and chemically destroyed only after many hours in the furnace. It is relatively impermeable to gas, and being semi-fluid high aluminium layer, resistant to thermal shock.

The degree of oxidation is determined by measuring the carbon monoxide and carbon dioxide present in waste gases extracted during the heating of samples in an oxidising gas stream. At temperatures between 1000 ~ 1850 deg. C found in arc furnace, the uncoated graphite samples yield large amounts of CO & CO2. By

contrast, at 1000° C, the coated samples produce no CO or CO2, and even after some time at 1850 deg. C, no CO and only 2~5% of CO2 is found. The electrical resistance is reduced (and hence conductivity increased) by the application of coating. Laboratory tests have shown the coating itself to have an electrical resistance of 14.50-22.00μ ohm cm against that of graphite of 600~1000 μ ohm cm.

Benefits:

Reduction of the specific Graphite Consumption up to 25 %.

- Reduced Side Oxidation
  - Reduced Oxidation Cone
  - Increased Tip Diameter
- Reduced Tip Consumption
  - Reduced Number of Electrode Connections
  - Reduced Tip Losses

Improved Conductivity of the Electrodes

- By the use of high conductive aluminium
- By a redistribution of the electrical current flow

Increased Electrical Loading Capacity of the electrodes

- By relieving the electrical strain to the electrode centre and the nipples
- By increasing the electrical conductivity by 20-25%

Time saving

- Reduced number of electrode connections
  - improved working conditions for the furnace staff
  - reduced crane times

Added Benefits

- Throughout the life of coating, it protects the surface of graphite electrodes from oxidation
- Coating forms a high conductivity, low resistivity skin which can increase the current carrying capacity of the electrodes, permitting more current to be passed through the same sized electrode, or same current through a smaller diameter electrode.

Sizes:

Nominal Diamter	Typical Diameter	Diameter Tolerances		Nominal Length			
mm	mm	Max mm	Min mm	mm	mm	mm	mm
350	356	358	352	1800	2100		
400	406	409	403	1800	2100	2400	
450	457	460	454	1800	2100	2400	
500	508	511	505	1800	2100	2400	2700
550	559	562	556		2100	2400	2700
600	610	613	607		2100	2400	2700

Note: special diameters and / or length on request.