According to the proportion of acid oxides and alkaline oxides in the slag, welding rods are divided into two categories - acid electrodes and alkaline electrodes. When the proportion of acid oxide in the slag is high, it is an acid electrode, and vice versa.

From the comparison of welding process, the arc of acid electrode is soft, the spatter is small, and the slag fluidity and coverage are good, therefore, the appearance of the weld is beautiful, the welding wave is fine, and the forming is smooth: the arc of the alkaline electrode is not stable enough, the coverage of the slag is poor, the shape of the weld is convex, and the appearance of the weld is rough, but it is easy to operate in upward vertical welding and upward welding.

The coating of the acid electrode contains more acid oxides, and the oxidation is strong, so the alloying elements are burned more during the welding process, and at the same time, due to the more hydrogen and oxygen content in the weld metal, the plasticity and toughness of the deposited metal are low. Typical acid electrodes are E6013, E7016, E8016, E9016, etc.

The coating of alkaline electrode contains a large amount of alkaline oxide, and there are more ferroalloys as deoxidizers and alloy infiltrating agents, so the coating has sufficient deoxidation capacity. Furthermore, alkaline electrodes mainly rely on marble and other carbonates to decompose carbon dioxide as a shielding gas, compared with acid electrodes, the partial pressure of hydrogen in the arc column atmosphere is lower, and the calcium fluoride in fluorite is combined with hydrogen at high temperature to form hydrogen fluoride (HF), thereby reducing the hydrogen content in the weld, so alkaline electrodes are also called low-hydrogen electrodes. When welding with alkaline electrode, it has high plasticity and impact toughness due to the less oxygen and hydrogen content in the weld metal and the less non-metallic inclusions. Typical alkaline electrodes are E7015, E8015, E9015, etc.

As the national standard GB/T 3965-2012 *Method for Determination of Diffusion Hydrogen in Deposition Metals*, AWS A4.3-93 (R2006) *Standard Method for Determination of Diffused Hydrogen Content in Metals of Martensite, Bainite and Ferritic Steel Arc Welds*, ISO 3690:2018 *Welding and Related Processes—Determination of Hydrogen Content in Metal in Arc Welds*, JIS Z 3118:2007 *Method for Measuring Diffusion Hydrogen Content in Steel Welds*[1-3] It is required that when measured by mercury or gas chromatography in the laboratory, the diffuse hydrogen content in every 100g of deposited metal is ≤ 15ml for alkaline electrodes, but the acidity can be more than 15ml.