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EVENTS OCCURRING DURING ARC DISCHARGE

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Annotation: Arc discharge is a complex electrical phenomenon characterized by high-current conduction through ionized gas. This article explores the key phenomena occurring during arc discharge, including ionization, thermal and radiative emissions, electrode erosion, and plasma formation. The study also examines the factors influencing arc stability and the transition between different arc modes. Understanding these phenomena is crucial for applications in welding, electrical circuit protection, and plasma-based technologies.

Keywords: Arc discharge, ionization, plasma formation, electrode erosion, thermal emission, electrical conductivity, arc stability, high-temperature phenomena, gas ionization.

Various materials electricity current various How does it work of the material conductivity in it free , electric with charged particles electrons and ions to the amount and this electricity charge carriers how speed with to move is related. Consequently , in the material charge carriers how much many if and they how much mobile if the material resistance that much less Gases (this including air) under normal conditions electricity what is it does not transfer . reason that is , usually under the circumstances they charge non-transportable neutral molecule and from atoms consists of will be. Their in the composition electrons , positive and negative ions only when they electricity conductive will be.

In gases electrons , positive and negative ions to them electricity area , heat impact when it does , gas through ultraviolet , x- ray and space rays when it passes, it is also radioactive substances releasing rays when it falls appearance will be.

Electricity of the vine gases through to pass **electric gas. discharge** is called.
Electricity gas discharges two main to the group divided into: independent and independent not been gas discharges.

Gas charge carriers external factors because of to the body arrival as a result observable electricity vine **independent gas discharge** it is said;

If M and N electrodes between gas if we heat it or X-ray , ultraviolet rays with If we irradiate , the gas molecules ionization happened Ionization process essence from the following consists of . External from factors received energy because of gas in the molecule one or one how many electronic from the molecule separated The result is molecule positive charged to the ion around remains . Separated came out of electrons one part neutral molecules with together negative charged ions to the body brings . Therefore for gas (ionization to the process cause was external factor ionizer (ionizer).

M and N electrodes between electricity field under the influence to the body arrived charge carriers because of observable electricity vine **independent gas discharge** It is called. M ustakil electricity gas in discharge electrons and ions external source without help harvest will be (welding) arc so discharge is considered).

Independent gas discharges some types with Let's get acquainted.

1. Crown discharge . Discharge this type to the body when it arrives electrodes near just like sun to the crown similar radiation is observed . Crown discharge to the body arrival for

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finally strong uneven electricity field there is to be condition . For example , large high-voltage electricity vines conductor wires Let's see . Wire and the earth of the capacitor two to consider as a cover This is possible . electricity field uneven is , area strength wire near very big to value achieves . In this field gas electricity field under the influence finally intensive accordingly ionizes . Therefore for this in the field the wire snow from the side surrounded received radiation , that is independent gas discharge This is observed . electricity of energy waste to be reason will be . Crown discharge only wires around not , maybe strong and uneven electricity field to the body arrived electrodes also around the body For example , the electrode any part curvature radius small was threesome has if so , this electricity in the field (three) charge concentration very increasing goes . That's why for this threesome around radiation is observed . Crown discharge ship of masts , trees It is also observed at the ends . Old at times this The phenomena were called " the lights of Saint Elma . "

2. Sparkling discharge (spark) . Capacitor coatings or induction reel of the scythe two tip between voltage finally when it is large of gas motivation accordingly from a tattoo ionization as a result short timely discharge spark to the body comes . The most huge spark Lightning is a discharge . Lightning clouds between or cloud with Earth between big potentials difference to the body arrival as a result appearance will be. Spark nearby gas high to temperatures it gets hot and sharp expands . This is own in turn sound of waves to the body to come cause It will be. Yashin's length up to 50 kilometers , current power Up to 20,000 A It will . That's why lightning for because of to the body coming sound , that is thunder very strong will be.

3. Electricity discharge (electric) arc). The current pole connected electrodes to each other if we touch and electricity vine If we conduct , the electrodes to each other touching standing ends It gets hot . Then them from each other a little Let's move it away . Cathode become service doer electrode very many thermoelectrons These thermoelectrons electrodes between gas ionizes . As a result electrodes between bow shaped strong (eye) dazzling at the level bright (shining) appearance It will be . electricity arc or Petrov arc It is called . Electricity arc from a spark different as , continuously continue will reach .

Charge carriers to the body to come provider main processes ionization , recombination and electronic emission are processes .

Electrons and ions harvest to be process ionization , electrons and ions was gas and ionized It is called gas . Electricity till gas range through when it passes positive ions negative to the pole (cathode), negative ions and positive It tends to the pole (anod). Movement on time some ions and electrons collide and neutralize , and the neutralized atom and molecules harvest does . Neutral atoms and molecules harvest to be process again This is called recombination . Again combination on time electromagnetic radiation in the style of energy Electricity gas in discharge electrode negative the surface of the cathode ions with bomber when it does , this to the surface electromagnetic radiation impact when it does , high temperature under the influence and electricity area when placed negative from the surface of the pole (cathode) external to the environment electrons It comes out . Man fii pole from the surface external to the environment electrons radiation electronic is called emission . So so , bow in discharge ions harvest will be , gases ionization reverse process again combination with together electronic There will also be emissions .

Ionization and wake up potentials . Atomic nucleus from their connections electron dissociate , forming a positive ion to do for known in quantity energy spending to do necessary . The electron separation for spent energy ionization The work was called . In electron volts expressed ionization work ionization The gas is called the potential . molecule or to the atom

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connected to the electron any additional quantity energy if given , electronic energetic level higher was new into orbit passes , molecule or an atom excited in case Gas atom or molecule wake up for spending to do need was in electron-volts expressed energy amount wake up potential It is called . Gas atom or molecule woke up status stable it won't be possible and electronic again back stationary into orbit return possible , atomic or molecule and to a normal state without waking up return possible . In this wake up energy surroundings into space light electromagnetic radiation in the style of is transmitted.

Ionization and wake up potential size of the atom to nature related . Cesium of steam ionization potential (3.9 eV) is the most small , helium of gas ionization potential and the most will be large (24.5 eV) . Alkaline-earth Electrons in metals (cesium , potassium , sodium , barium , calcium) with core between connection strong not , that's why for their ionization potentials the most small will be , wake up and electron release to work iron , manganese , copper and to nickel relatively less energy is spent . Ionization and wake up potential being welded from metal less was elements electrode coatings to the composition is entered , in which in gases bow discharge stagnation increases . The electron from metal or liquid from the body separation for necessary was energy amount electron exit is called work and it is in electron-volts is expressed .

Conclusion.

Arc discharge involves various interrelated physical and chemical processes, including ionization, intense heat generation, and electrode wear. These phenomena significantly impact the efficiency and stability of arc-based applications such as welding, lighting, and plasma cutting. A deeper understanding of these processes can lead to advancements in materials science, electrical engineering, and industrial technologies, optimizing the performance and longevity of arc-related systems.

Reference:

1. Qosimov, K., Xoshimov, X., Yo‘ldashev, S., & Ashurboyev, J. (2019). RESEARCH OF THE CHEMICAL COMPOSITION OF THE WORKING SURFACE OF THE GIN GRATE WHICH IS RESTORED BY WELDING. Textile Journal of Uzbekistan, 8(1), 26-31.
2. Хошимов, Х. Х., & Юлдашев, Ш. Х. (2019). Восстановление изношенных колосников при производстве хлопка в хлопчатобумажной промышленности (Doctoral dissertation, Белорусско-Российский университет).
3. ХОШИМОВ Х. Х., ЮЛДАШЕВ Ш. Х. ВОССТАНОВЛЕНИЕ ИЗНОШЕННЫХ КОЛОСНИКОВ ПРИ ПРОИЗВОДСТВЕ ХЛОПКА В ХЛОПЧАТОБУМАЖНОЙ ПРОМЫШЛЕННОСТИ //Машиностроение и металлообработка. – 2019. – С. 68-70.
4. Косимов, К. З., Муйдинов, А. Ш., & Хошимов, Х. Х. (2017). ПЕРСПЕКТИВЫ ВОССТАНОВЛЕНИЯ ИЗНОШЕННЫХ ДЕТАЛЕЙ МАШИН НАПЛАВКОЙ КОМПОЗИЦИОННЫХ ПОРОШКОВЫХ МАТЕРИАЛОВ. Вестник Башкирского государственного аграрного университета, (3), 54-59.
5. Косимов К. З. и др. ПЕРСПЕКТИВЫ ВОССТАНОВЛЕНИЯ ИЗНОШЕННЫХ ДЕТАЛЕЙ МАШИН НАПЛАВКОЙ КОМПОЗИЦИОННЫХ ПОРОШКОВЫХ МАТЕРИАЛОВ //Вестник Башкирского государственного аграрного университета. – 2017. – №. 3. – С. 54-59.
6. Xamidjanovich, XX (2022). Arra paxta tozalash mashinasining ish kamerasini takomillashtirish. ACADEMICIA: Xalqaro multidisipliner tadqiqot jurnali , 12 (4), 297-299.

ISSN: 2692-5206, Impact Factor: 12,23
American Academic publishers, volume 05, issue 02,2025
Journal: https://www.academicpublishers.org/journals/index.php/ijai

7. Xamidjanovich, XX, QoChqarboyevich, IM, Azimovich, AS, & OGLi, XFB (2021). Payvandlash jarayoni bilan jin qovurg'alarining ish yuzasini tiklash eroziyasi. Amerika muhandislik va texnologiya jurnali , 3 (06), 153-159.
8. Хошимов, Х. Х. (2023). РАСКИСЛЕНИЕ СВАРНЫХ ШВОВ. Новости образования: исследование в XXI веке, 1(6), 709-718.
9. Хошимов, Х. Х., & Абдуллаев, Ш. А. (2023). ЭРИТИБ ҚОПЛАШ УСУЛИНИНГ ОПТИМАЛ РЕЖИМЛАРИНИ ТАХЛИЛИ. Новости образования: исследование в XXI веке, 1(6), 774-785.
10. Хошимов, Х. Х., & Абдуллаев, Ш. А. (2023). ПРЕДОТВРАЩЕНИЕ ПОЯВЛЕНИЯ ПОРИ В СВАРНОМ ШВЕ. Новости образования: исследование в XXI веке, 1(6), 699-708.
11. Xoshimov, X., Yuldashev, S., Muydinov, A., & Kosimov, K. (2024 yil, mart). Paxtachilik qovurg'asining resursini oshirish bo'yicha olib borilgan ilmiy-tadqiqot ishlarining tahlili va natijalari. AIP konferentsiyasi materiallarida (3045-jild, №1). AIP nashriyoti.