

Mass transfer's dynamics through the welding arc

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ABSTRACT

The electrical arc welding process is lead by several complex electrical, metallurgical, chemical etc. processes. An important process is the mass transfer through the electrical arc, depending on the equilibrium of the forces' fields existing in the zone of the electric arc plasma. In order to ensure the basics for the antigravity welding processes (welding in difficult positions, when the molten welding metal may flow) it is very important to know the details of this process. The paper presents several fundamentals and a new idea about the mass transfer through the welding electrical arc. There are presented several forces acting inside the arc and others on the molten metal pool, as too. Welding current has two components: one created by the electrons' thermal-electric emission and the other ensured by the molten metal drops' transfer. The process of drops detaching from the melting electrode, including the equilibrium between the surface stress force and the electrostatic force are presented from the beginning. An equation describes the frequency of molten metal drops. Comparison between the theoretical model and the experiments' data are presented in conclusions.

References

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