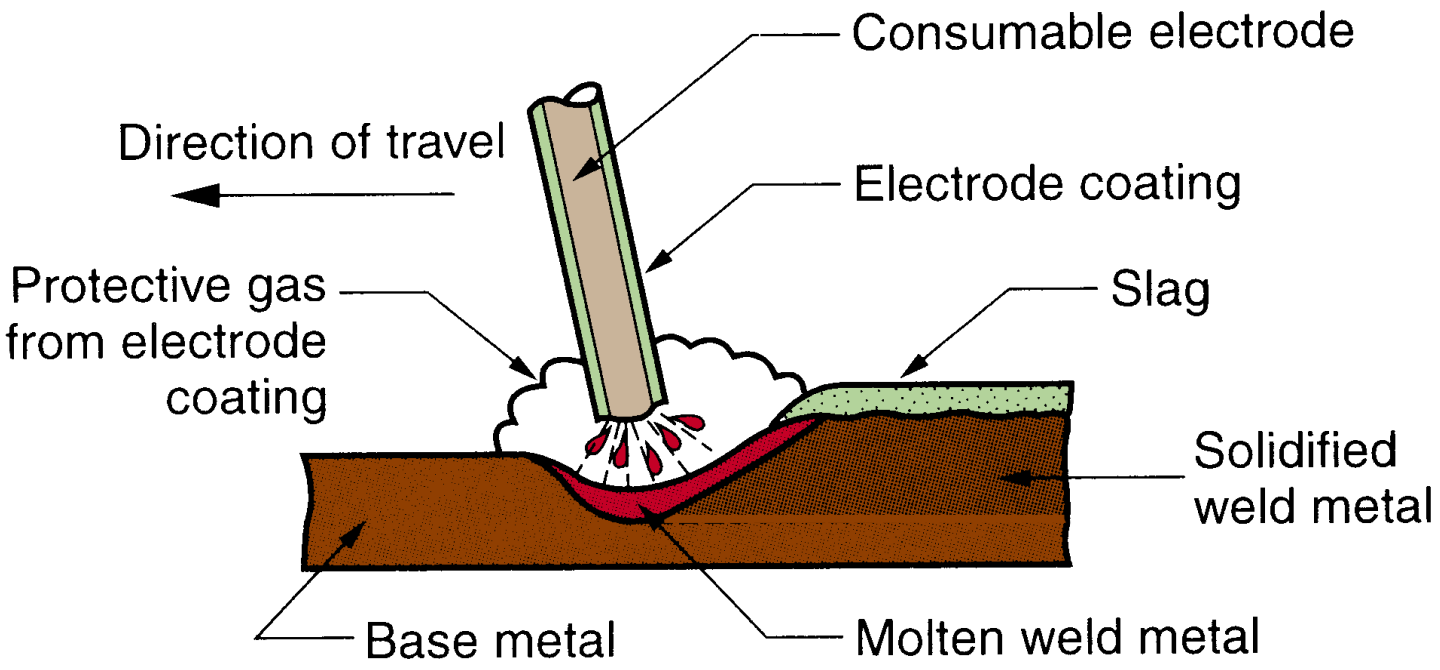
MANUFACTURING PROCESSES

MMAW or SMAW

1.A. Shielded/Manual Metal Arc Welding



1.A. Shielded/Manual Metal Arc Welding

- Shielded metal arc welding (SMAW) is an AW process that uses a ***consumable electrode*** consisting of a ***filler metal*** rod coated with ***chemicals*** that provide ***flux*** and ***shielding***.

1.A. Shielded/Manual Metal Arc Welding

- The ***filler*** metal used in the rod must be ***compatible*** with the ***metal to be welded***, the composition usually being very close to that of the base metal.
- The coating consists of powdered ***cellulose*** (i.e., cotton and wood powders) mixed with ***oxides, carbonates***, and other ingredients, held together by a ***silicate binder***.
- ***Metal powders*** are also sometimes included in the coating to ***increase*** the ***amount of filler metal*** and to ***add alloying elements***.

1.A. Shielded/Manual Metal Arc Welding

- The heat of the welding process melts the coating to provide a protective atmosphere and slag for the welding operation.
- It also helps to stabilize the arc and regulate the rate at which the electrode melts.
- Currents typically used in SMAW range between ***30 and 300 A*** at voltages from ***15 to 45 V.***

1.A. Shielded/Manual Metal Arc Welding

- Selection of the proper ***power parameters*** depends on the metals being welded, electrode type and length, and depth of weld penetration required.
- Shielded metal arc welding is usually performed ***manually***.
- Common ***applications*** include construction, pipelines, machinery structures, shipbuilding, job shop fabrication, and repair work.

1.A. Shielded/Manual Metal Arc Welding

- It is preferred over oxyfuel welding for thicker sections—above 5 mm—because of its higher power density.
- The equipment is portable and low cost, making SMAW highly versatile and probably the most widely used of the AW processes.
- Base metals include steels, stainless steels, cast irons, and certain nonferrous alloys.

1.A. Shielded/Manual Metal Arc Welding

- It is not used or seldom used for aluminum and its alloys, copper alloys, and titanium.

POLARITY

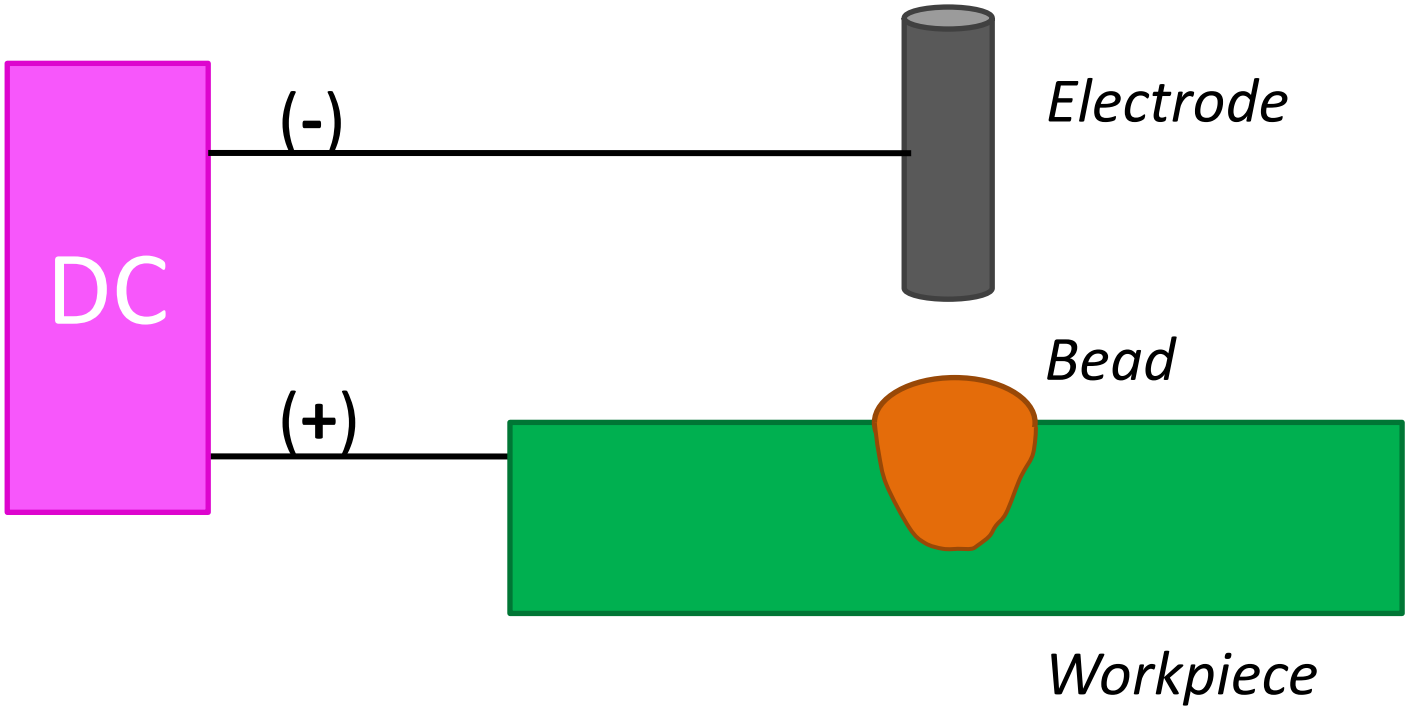
- When using a DC power source, the question of whether to use electrode negative or positive polarity arises.
- Some electrodes operate on both DC straight and reverse polarity, and others on DC negative or DC positive polarity only.
- Direct current flows in one direction in an electrical circuit and the direction of current flow and the composition of the electrode coating will have a definite effect on the welding arc and weld bead.

POLARITY

- Figure shows the connections and effects of straight and reverse polarity.

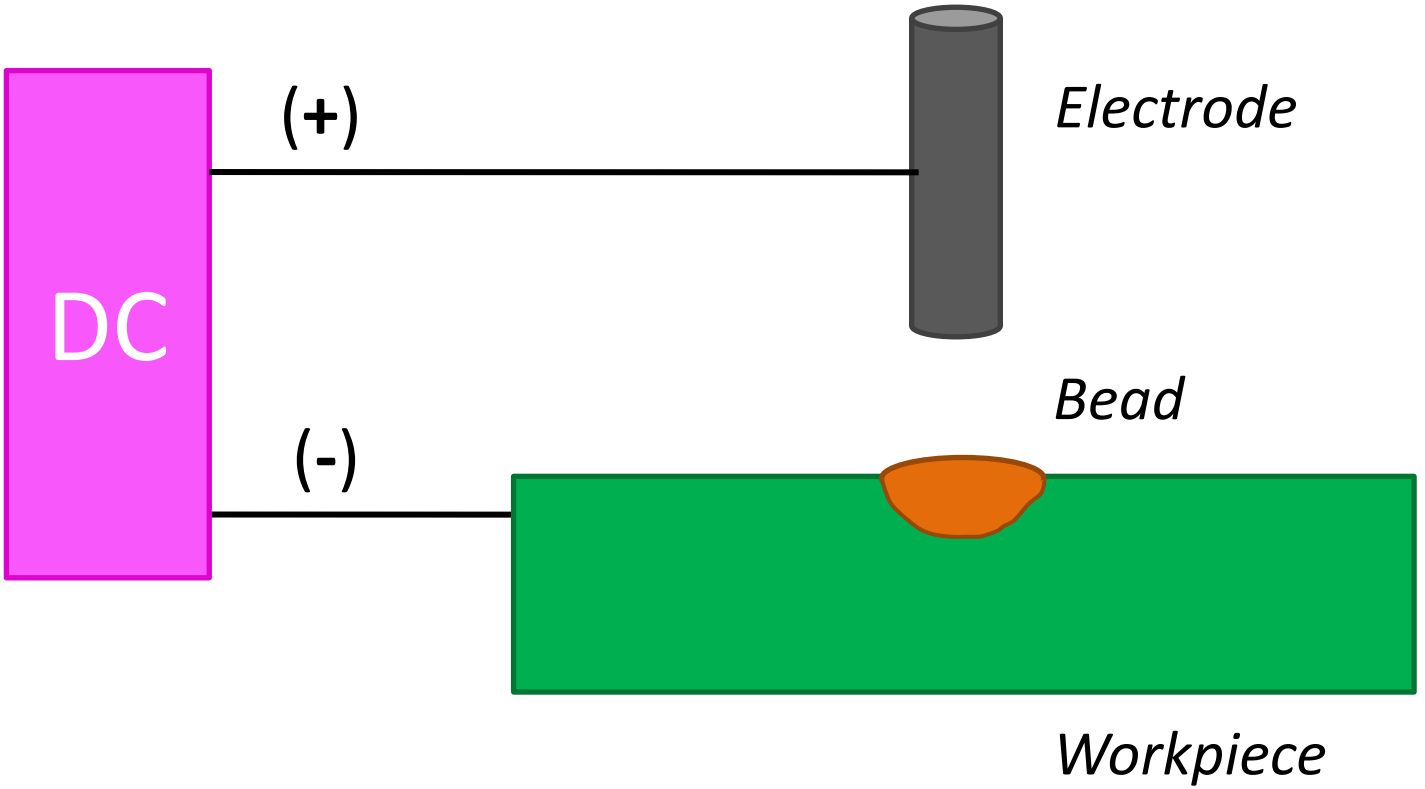
DC Electrode Negative (DCEN) or Straight Polarity

- **DC Electrode Negative (DCEN)** or **Straight Polarity** causes heat to build up on the workpiece, thereby increases the weld penetration.



DC Electrode Positive (DCEP) or Reverse Polarity

- Reversing the polarity ie. **DC electrode positive** **(DCEP)** increase the electrode melting rate and decrease the depth of the weld.



AC

- With alternating current the polarity changes over 100 times per second, creating an even heat distribution and providing a balance between electrode melting rate and penetration.