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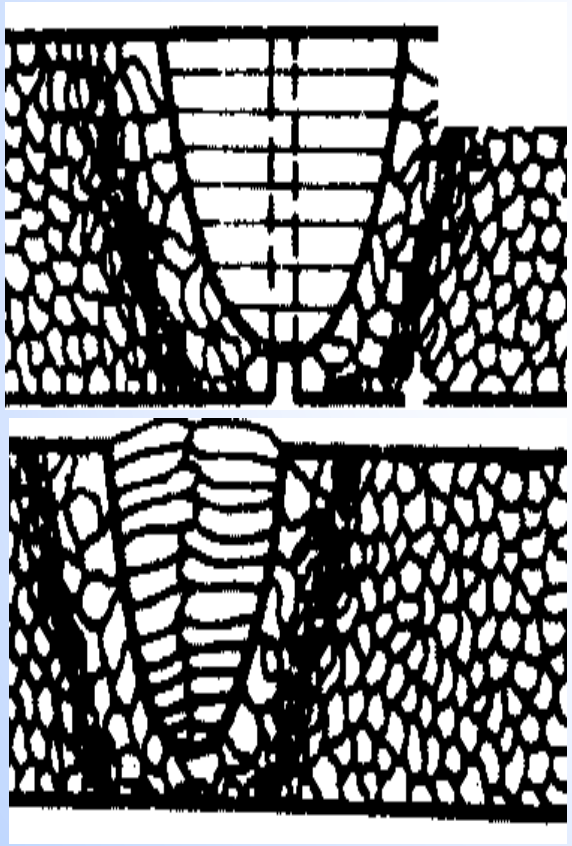
MODULE A
Introduction to the problems of welding

Producing a weld joint during the fusion welding

Schematic representation of the formation of weld joints by fusion welding



Initial alignment of the weld surfaces of the two parts to be welded (dashed lines) and the molten area of the weld surface; region of the weld metal is indicated by horizontal lines.

The weld joint after the end of crystallization of the weld metal.

Koukal, J., Schwarz, D., Hajdík, J. *Materiály a jejich svařitelnost.* 1. vyd. Ostrava: VŠB – Technická univerzita Ostrava, 2009. s. 14.

Macrostructure weld metal

Producing a weld joint at the melt welding

- The source of heat is carried out thermal activation of the initial weld edges (dashed lines in the figure) to the extent that the weld surfaces of the two parts to be welded is melted.
- Molten weld metal, characterized in the picture with horizontal lines, located between the non-molten walls of the welded material as in the container.
- Atoms molten metal can freely move in the melt, may be closer to unmatched surfaces at a distance corresponding to the lattice parameter jointed metal and weld metal, if non-molten walls wetted.
- Thus created conditions for forming a metal bond.

Producing a weld joint at the melt welding

- Ceases to operate, heat activated, then by cooling the molten metal solidifies, wherein the crystallization begins in the metal walls (surfaces) heat dissipation.
- IN crystallization process is applied between the solid metal and the crystals emerging conventional metal bond.
- Crystallization weld metal leads to the formation of joint crystallites that grow from the frontier melted and unmelted metal, so-called. ztavení border.
- Except crystallization proceeds in high temperature diffusion.

Producing a weld joint during the fusion welding

- After complete solidification of the molten metal a permanent joining of the original metallic parts without the use of external pressure.
- Adjustment weld surfaces can be varied and is governed by the thickness of the material and welding methods.
- Basic melting condition is a requirement to weld faces in order to obtain the weld pool, i.e. the molten weld metal.
- FROM It is apparent that for forming the fusible weldment is necessary to use intense heat source for the local rapid melting weld material and possibly even melting of the filler material.

The heat sources used for the fusion welding

Heat source	Smallest heating area [cm^2]	Max. thermal power $W.cm^{-2}$
Plamen C2 H2 - 02	1.10^{-2}	1.10^{3}
The arc technology 111	1.10^{-3}	1.10^{4}
Electric arc technology 131, 141	1.10^{-4}	1.10^{5}
plasma arc	1.10^{-5}	1.10^{7}
electron beam	1.10^{-7}	1.10^{8}
Laser	1.10^{-8} +1.10^{-11}	1.10^{9} + 1.10^{13}

KOUKAL, J., SCHWARZ, D., HAJDÍK, J. *Materiály a jejich svařitelnost*. 1. vyd. Ostrava: VŠB – Technická univerzita Ostrava, 2009. s. 16.