

Liquid Metal Flow Under Inhomogeneous Magnetic Field

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We present an experimental study of a liquid metal channel flow under the influence of inhomogeneous magnetic field. The problem is relevant to the electromagnetic braking of a molten metal in the process of continuous casting. It is shown that applied inhomogeneous magnetic field brakes an initial flow in its central part and transforms a nearly flat initial velocity profile into the M-shape one. Because of a stabilizing effect an intensity of velocity fluctuation decreases up to 8 times in the central part of the flow. The fluctuations do not develop in the side boundary layers until they flow inside the magnetic field. Contrary, downstream the magnet system the layers generate velocity fluctuations by intensity up to 27%. In a regime of weak instability the flow around a zone of applied magnetic field generates large-scale vortical structures confined in the space between inlet and outlet of magnetic field.

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