

An Experimental Setup for Impingement of Liquid Gallium

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Abstract

High-quality sprays with well-defined characteristics are essential for various industrial applications.

Understanding the dynamics that follow a droplet's impact on a solid surface is crucial for controlling liquid flow in processes ranging from aerosol and spray generation to drop-on-demand printing. The performance and quality of these systems depend significantly on design considerations.

Liquid metal sprays are particularly valuable for applications such as coating and surface treatments [1]. Among the elements in the periodic table, only mercury is a metallic liquid at room temperature. Four additional metals — francium, cesium, gallium, and rubidium—are liquids just above room temperature. The liquid state of these metals arises from the weak binding of their electrons to the atomic nucleus, which limits electron sharing between atoms and facilitates their transition from solid to liquid.

This study builds upon previous research [2]-[4] to investigate the spreading dynamics of liquid gallium, a metal of growing interest due to its unique properties. To enable these experiments, a specialized system was designed and constructed. The setup features a glovebox filled with heated inert argon gas, maintaining an oxygen-free environment, and includes a heating mechanism to raise the gallium to the desired temperature.

The system is equipped with high-speed imaging capabilities to capture and analyze the spreading behavior of gallium droplets in detail. This experimental approach aims to advance the understanding of liquid metal dynamics and inform the development of improved spray systems for industrial use.

Keywords: Drop impact, Liquid gallium, Deposition, Experimental study, Impingements

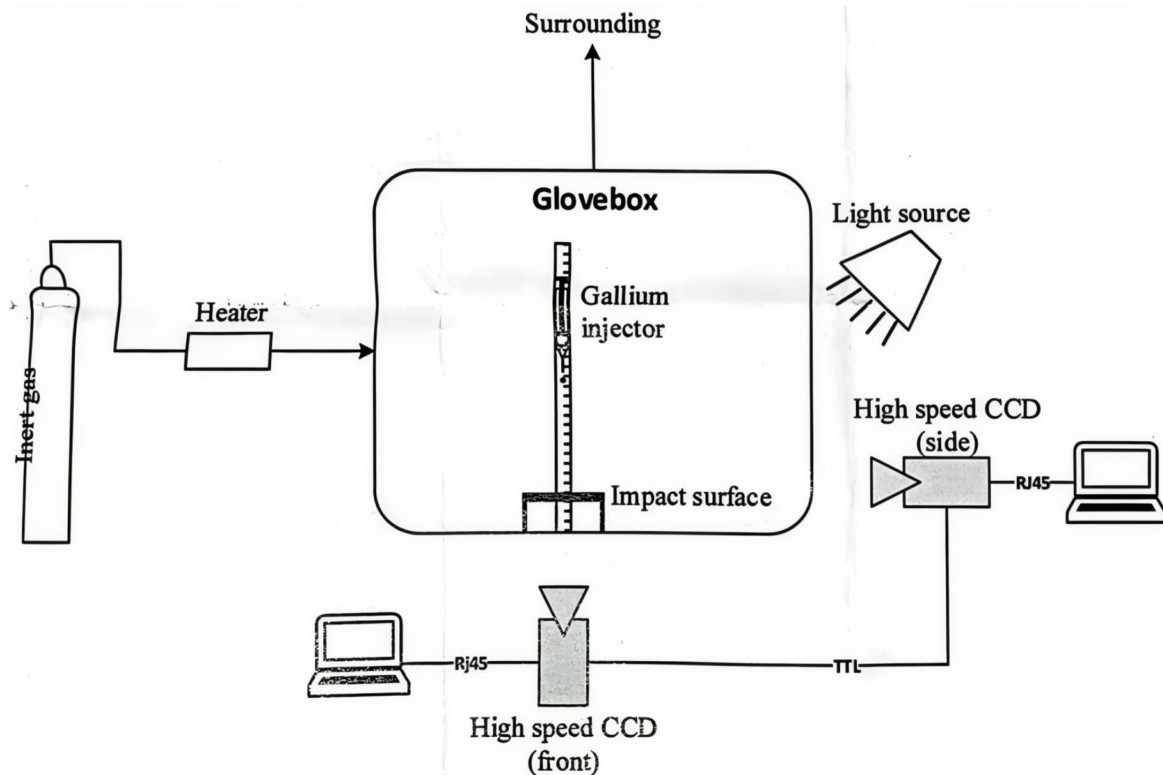


Figure 1. Graphical description of the experimental setup.