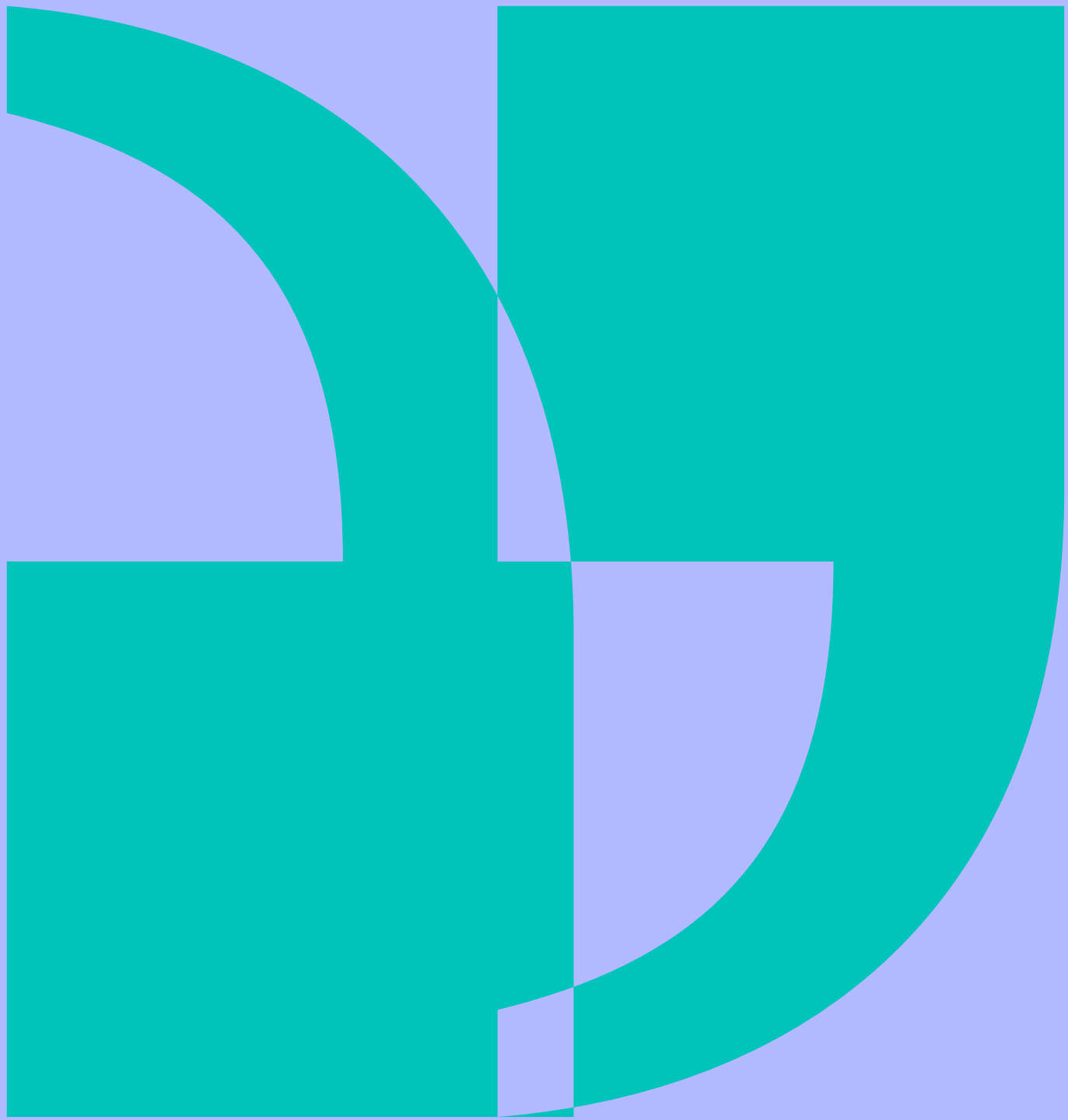


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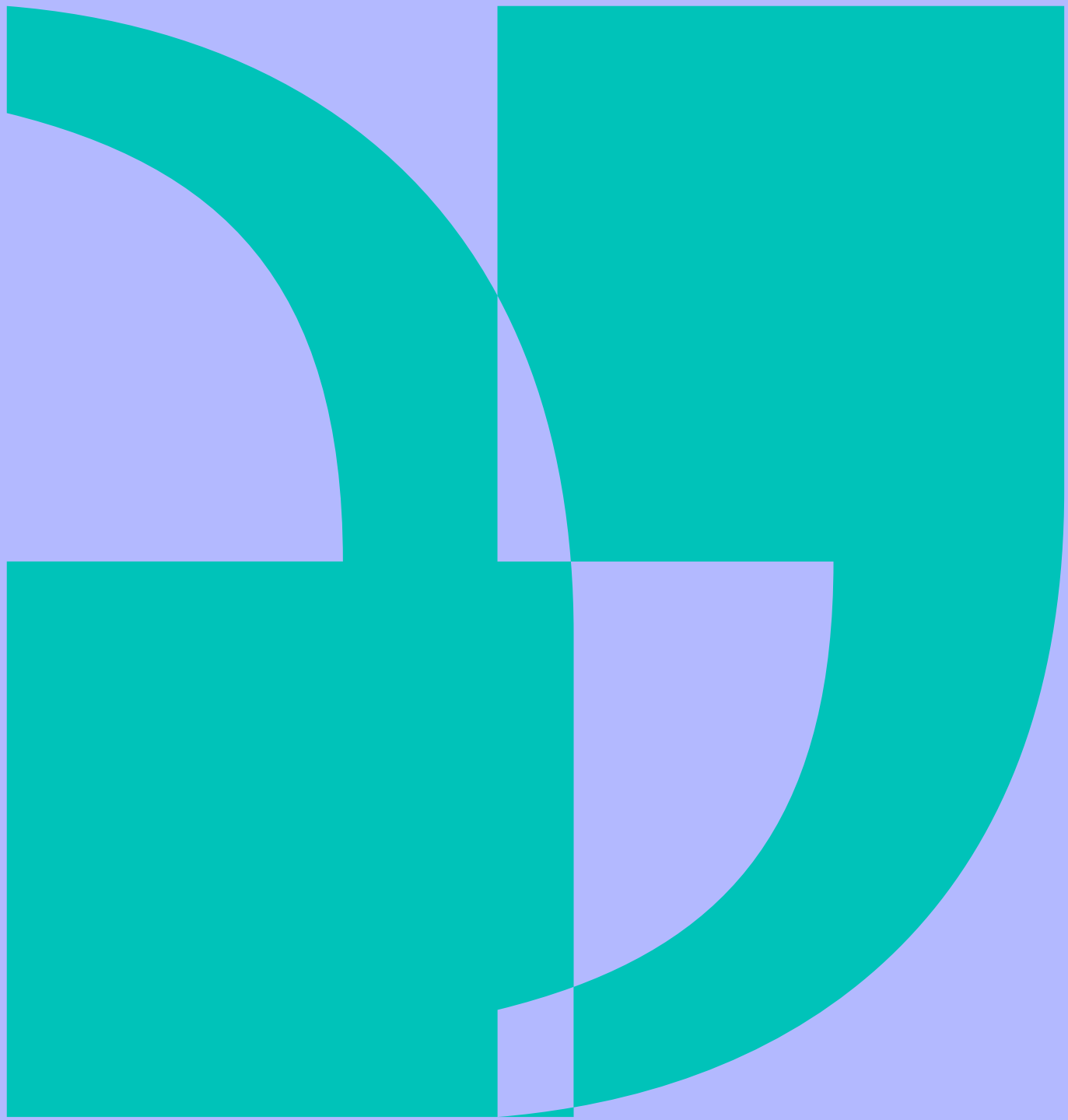
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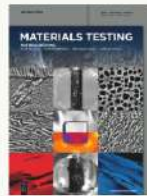
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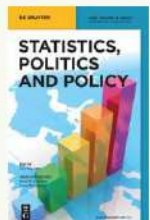
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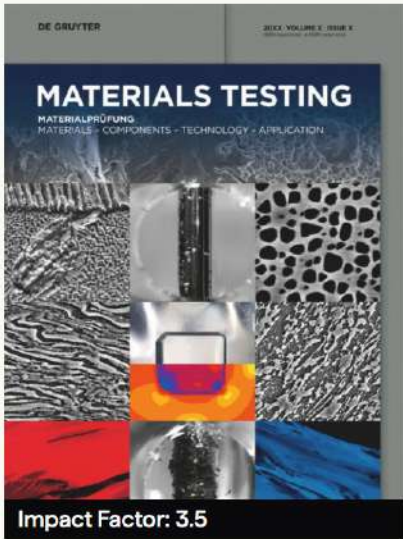
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# Effect of annealing for stress relief on the surface integrity of gray cast iron with lamellar graphite after cavitation erosion

<https://doi.org/10.1515/mt-2025-0044>  
Published online May 28, 2025

**Keywords:** cavitation erosion; pearlitic cast iron; lamellar graphite

**Abstract:** Cast iron components made of gray iron that come into contact with liquids under oscillating pressure may suffer damage caused by cavitation erosion. Understanding the mechanisms of initiation and development of their degradation in operating environments is essential for improving the lifespan and durability of the materials used in these engineering components. This study illustrates the cavitation erosion behavior of gray cast iron with lamellar graphite and a pearlitic metallic matrix, providing a detailed analysis of microstructural images of the damaged surface areas. The tests were conducted using an ultrasonic vibratory apparatus, with potable water from the public supply network as the test liquid. Based on cavitation curves, which were compared to those of unalloyed C45 steel that underwent annealing for softening to achieve a hardness similar

## 1 Introduction

Gray cast irons with lamellar graphite used in industry are ternary Fe–C–Si alloys, with silicon (Si) acting as the graphitizing element, present in concentrations ranging from 1.2 % to 3.5 %. The carbon content ranges from 2.4 % to 3.8 %, existing in forms such as pearlite, dissolved in ferrite, or as free graphite, depending on the cast iron's chemical composition and the conditions during solidification [1], [2].

For the same chemical composition, the metallic matrix in which the graphite is embedded depends on the design of the component (wall thickness) and the casting process (sand

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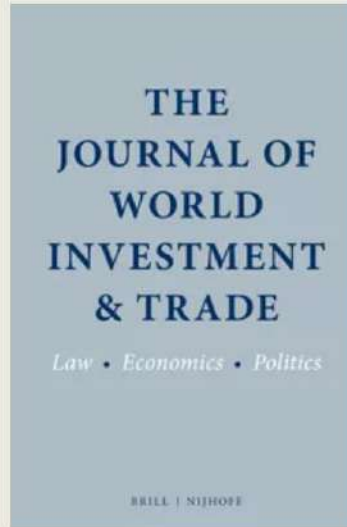
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