

Thermal Conductivity of Metal Powder For Use in Additive Manufacturing of Metals

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Question Being Answered

What are the thermal conductivity of metal powder materials used in additive manufacturing?

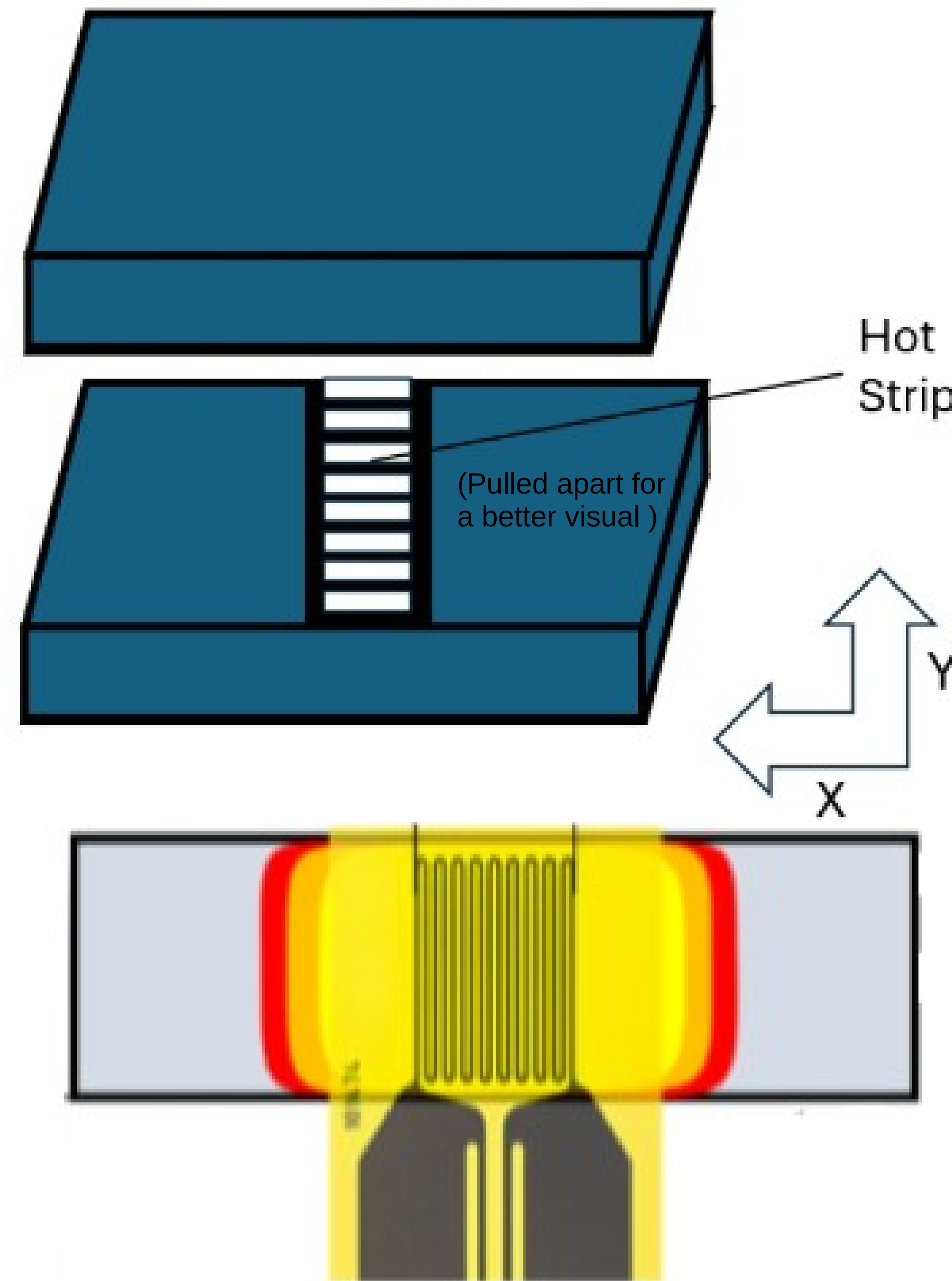
Purpose

The purpose of the research is to determine the thermal conductivity of metal powder materials used in creating safer and stronger medical implants, focusing on the transient hot strip method. This is needed for optimizing manufacturing processes, design and performance, material development, and material enhancement

Abstract

Additive manufacturing has been the main manufacturing technology used for building metal implants. We plan to build implants using metal powders and need to find the thermo-physical characteristics of the material to be able to optimize the process of powder bed melting for the materials. This project focuses on finding the thermo-physical characteristics specifically conductivity of various metal powders.

Diagrams



Bottom Image Reference:
Acquiring the 3D Thermal Conductivity Tensor of Carbon Nanotube (CNT) Textile - Application Notes. Hot Disk.

Transient Hot-Strip

The transient hot strip (THS) method is a quick and reliable technique of measuring both thermal conductivity and diffusivity. The experiment is made with a thin metallic strip which is placed on the sample surface and works as both a temperature sensor and resistive heater. A short current pulse is applied to the strip and generates a transient heat wave that will propagate into the sample. Monitoring the change in temperature over the very short time interval (less than two seconds) its diffusivity and conductivity can be extracted using heat conduction equations. Silas E. Gustafsson is the founder of the transient hot strip method and even further developed and polished it through the years.

Steps Moving Forwards

Other transient hot methods are being researched further such as transient hot plane and transient hot wire method. Which will be compared to the transient hot strips accuracy for metal powder.

Recognition

Thank you to my mentors Dr. Ladani and Vi for all of your help and assistance. This material is also based upon work supported by the National Science Foundation under Award No. 2152254, and a final thank you to FURI for sponsoring our research.