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# Non-Confidential Description - PSU No. 2761
# "Processing Parameters for Thin-Film Deposition of $MgB_2$ on Silicon Substrate"

**Keywords:**

Superconductors, electronics, boride, thin films

**Links:**

Inventor website-1
Inventor website-2
U.S. Patent #7,090,889
Related Publication

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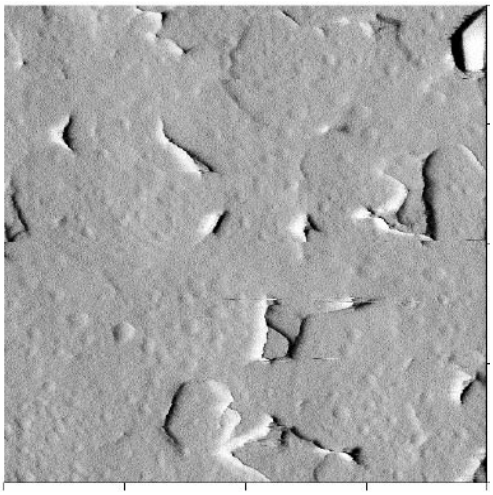

**Fig 1: AFM image of epitaxial $MgB_2$ film on a silicon carbide substrate.**

## Background

The newly discovered 39-K superconductor magnesium diboride ($MgB_2$) holds great promise for the field of superconducting electronics. Like the conventional superconductor Nb, it is a phonon-mediated superconductor, with a relatively long coherence length and two energy gaps. It is isotropic, with grain boundaries which are not weak links. These properties make the prospect of fabricating reproducible uniform Josephson junctions (the fundamental element of superconducting circuits) much more favorable for $MgB_2$ than for high-temperature superconductors. The higher transition temperature and larger energy gap of $MgB_2$ promise higher operating temperatures and potentially higher speeds than Niobium-based integrated circuits. However, success in $MgB_2$ Josephson junctions has been limited because of the lack of an adequate thin-film technology; specifically, a continuing need exists for the efficient manufacture of boride thin films on silicon.

## Invention Description

The present invention relates to thin films for electronics and methods of their formation and, in particular, to boride thin films on silicon for use in superconducting electronics such as superconducting integrated circuits. The method comprises introducing or providing a substrate containing silicon, i.e., a substrate typically used in fabricating semiconductors, into a reaction or deposition chamber. The method further includes physically generating vapor from at least one magnesium target, which is within the chamber containing the substrate.

## Advantages/Applications

- Only current solution for manufacturing boride thin films on a silicon substrate

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