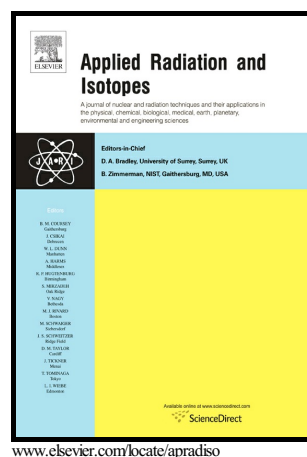


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# Broadband luminescence of Cu nanoparticles fabricated in SiO<sub>2</sub> by ion implantation

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## Abstract

In this study, we investigate optical properties of metal nanoparticle crystals fabricated by implanting copper (Cu) ions into single silica (SiO<sub>2</sub>) crystals with 400 keV at various ion doses. The Cu implanted SiO<sub>2</sub> (SiO<sub>2</sub>:Cu) crystal produces a broadband luminescence emission, ranging from blue to yellow, and having a blue luminescence peak at 546 nm. Such anomalous luminescence emission bands suggest that the ion implantation may give rise to aggregation of Cu nanoparticles in the host matrix. The boundary element method-based modelling of a given Cu nanoparticle aggregation was employed to justify the broadband luminescence emission. Formation of Cu nanoparticles in SiO<sub>2</sub> is predicted through their optical absorption data. The experimental results are compared with results of Mie calculations and we observe that the higher ion dose produces the larger particle size.

**Keywords:** SiO<sub>2</sub>, ion implantation, metallic nanoparticles, luminescence, nanoparticle aggregation.

## 1. Introduction

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<sup>1</sup> Both authors contributed equally to this work.

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