

**SYNTHESIS, CHARACTERIZATION, AND DRUG RELEASE PROPERTIES OF
LIDOCAINE-LOADED POROUS (RICE HUSK) NANOSILICA/
POLYCAPROLACTONE FIBER COMPOSITES**

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An Undergraduate Thesis Submitted to the Faculty of the Department of Chemistry,
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in Partial Fulfillment of the requirements
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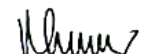
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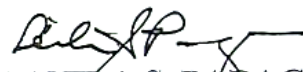
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-Proverbs 3:19*

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“Lab muna bago Love”

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SYNTHESIS, CHARACTERIZATION, AND DRUG RELEASE PROPERTIES OF LIDOCAINE-LOADED POROUS (RICE HUSK) NANOSILICA/POLYCAPROLACTONE FIBER COMPOSITES¹

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ABSTRACT

Background: Prolonging drug release has acknowledged much research using incorporation of drugs in biocompatible fiber composites that permit drugs to be released for longer time periods in a controlled manner to help solve biological and medical problems. In this study, lidocaine-loaded nanosilica/PCL fiber composites with differing amount of nanosilica incorporated to the polymer solution were evaluated for cumulative release to examine the protracting effect of silica nanoparticles on the release of lidocaine from fiber composites to the PBS solution. **Methods:** Rice husk samples were ashed at 650°C for 6h, digested with 2.5N NaOH for 4h, precipitated with 5N H₂SO₄, aged for 24h, and dried at 80°C for 24h to produce silica nanoparticles and were examined using FTIR, SEM, and XRD. Lidocaine was loaded to silica nanoparticles using 300mg of each component stirred for 6h, centrifuged, and collected to determine the initial amount of lidocaine loaded to the nanoparticles. The electrospun composites were evaluated for cumulative release immersed in PBS solution and shaken at 100 cycles/min. The absorbance of each solution was determined at time intervals: 2, 4, 26, 49, 72, and 74h. **Results:** The average diameter of nanosilica was determined to be 15.94 nm and had amorphous and nontoxic character. After 74h time period, each composite achieved release equilibrium at time between 72 and 74h. FTIR analysis confirmed the presence of relative functional groups for nanosilica and fiber composites. The cumulative release percentage of fiber composites established that the highest nanosilica content (5 wt%) gave the lowest released amount of 45.99% compared to 55.96% for 3 wt%, 59.60% for 1 wt%, and 88.58% for pure PCL. **Conclusion:** Drug loading and incorporation of silica nanoparticles from rice husk ash to fabricate fiber composites can prolong and improve drug release characteristics.

Keywords: Rice husk ash, silica nanoparticles, lidocaine, drug loading, electrospinning, Polycaprolactone (PCL), lidocaine-loaded nanosilica/PCL fiber composites, cumulative drug release.

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