

Accepted Manuscript

Low-cost plug and play photochemistry reactor

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PII: S2468-0672(17)30052-4
DOI: <https://doi.org/10.1016/j.ohx.2017.11.001>
Reference: OHX 17

To appear in: *HardwareX*

Received Date: 13 September 2017
Revised Date: 27 November 2017
Accepted Date: 29 November 2017



Please cite this article as: D. Dellal, E. Yee, S. Lathwal, H. Sikes, J. Gomez-Marquez, Low-cost plug and play photochemistry reactor, *HardwareX* (2017), doi: <https://doi.org/10.1016/j.ohx.2017.11.001>

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Title: Low-cost plug and play photochemistry reactor

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Abstract: Polymerization-based amplification (PBA) uses a visible-light photopolymerization reaction for rapid, low-cost signal amplification and colorimetric detection in disease diagnostics. PBA is particularly useful for point-of-care testing (POCT) in the developing world where laboratory infrastructure and access to advanced technologies may be limited. To date, PBA has required expensive (~5K USD), desktop-based light sources to drive these photopolymerization reactions, which has limited its use in limited-resource areas and for POCT applications. Here, we present a portable, lightweight, and low-cost device that can generate light of the intensity and wavelengths required to perform the PBA reactions rapidly (<100 seconds) with minimal energy consumption. We developed analog and digital versions of the device that meet these criteria and can operate on their own without the requirement of a computer to run necessary software. Lastly, they both have the added functionality to dim the intensity of the LED to allow customization of the reaction conditions to the needs of individual assays.

Keywords: POCT, Arduino, Diagnostics, LEDs

Specifications table

Hardware name	ArduGlow
Subject area	<ul style="list-style-type: none"> • Medical (e.g. Pharmaceutical Science)
Hardware type	<ul style="list-style-type: none"> • Biological sample handling and preparation
Open Source License	<i>Please specify the open source license. For more details see the guide to authors.</i>
Cost of Hardware	\$68
Source File Repository	https://osf.io/yn9x2/

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