Can 3D printing be used for chemistry labware?

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The most common method of three-dimensional printing of materials is the method of layer-by-layer fusing (FDM) and we studied the influence of parameters of this type of printing on the possibility of using printed products in a chemical laboratory.

It is found that the permeability of the walls of printed products strongly depends on their geometric shape and gradually decreases in the following order: cylinder> cube> pyramid> sphere> cone. It is established that neither the extrusion temperature nor the type of polymer has a significant effect on the porosity. The main parameters affecting the porosity of 3D products are the extrusion coefficient, wall thickness and G-code. Optimization of these parameters leads to a significant improvement in the integrity of the objects.

Polypropylene products printed with optimized parameters were impermeable to the solvent and resistant to the conditions necessary for the reactions of Suzuki and Heck. Conversion reactions performed in printed products of an optimized type, showed the same values as for glass tubes. The study shows that 3D printing is suitable for the production of finished and functionally compatible products from a wide range of polymers, even when using inexpensive personal 3D printers.

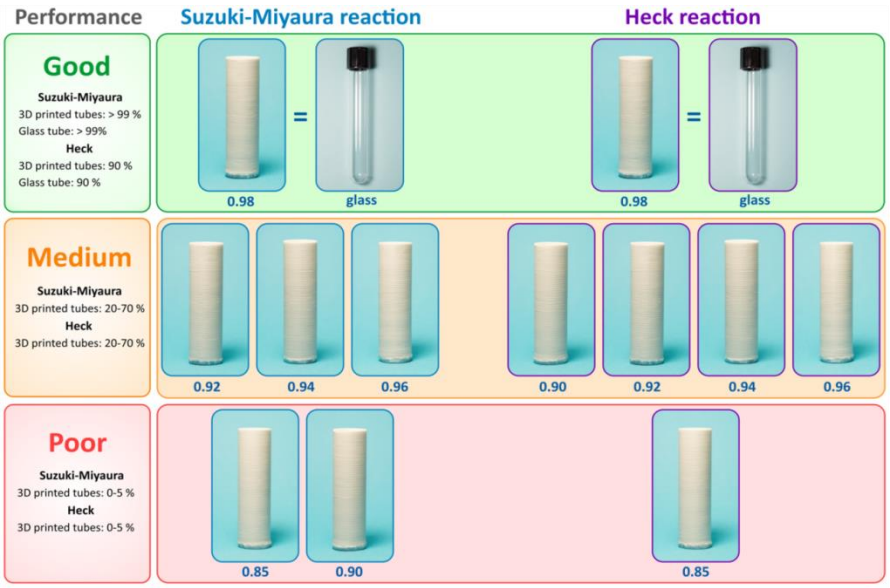

Figure 1. Comparison of polypropylene printed products with a glass tube in the reactions of Suzuki and Heck at various extrusion coefficients

1. Gordeev EG, Galushko AS, Ananikov VP (2018) Improvement of quality of 3D printed objects by elimination of microscopic structural defects in fused deposition modeling. PLoS ONE 13(6): e0198370. https://doi.org/10.1371/journal.pone.0198370