

Vacuum Compatibility of 3D Printer Materials

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When working with vacuums, objects placed in the chamber must be vacuum grade or manufactured to be able to withstand and maintain your vacuum. This can be costly or may take a long time for the part to be manufactured. 3D printing, on the other hand, has become more prominent in many professions, including physics, as a quick and cheap way to fabricate components. The purpose of this study is to determine how different 3D printed materials behave in vacuum. The research consists of using a Pfeiffer HiCube vacuum pump along with 3 pressure gauges: a cold and hot cathode (Wasp and Hornet from Instrutech INC), and a Convectron gauge (from MKS). Each gauge is connected to an Arduino that measures the pressure inside the chamber over time with a python script to plot and fit the data for analysis. Commonly found 3D printing materials, including PLA, Nylon, TPU, PP and ABS, were quantitatively compared to document the rate of outgassing for each material and make suggestions on the best material to use for 3D printed vacuum components. In this presentation, I will present the instruments developed for the study, the experiments conducted, and the results of the vacuum tests with each material.