Transparent PET optical window for microfluidic cell culture device

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Abstract

Microfluidic cell culture chambers have enabled the isolation, culture and growth of various species of microorganisms and human cells. However, based on elastomers such as poly(dimethyl siloxane) (PDMS), these culture devices are not readily amenable to imaging or spectroscopy in the optical and infrared spectrum. Specifically, while PDMS is optically transparent, significant diffraction and reflection of light waves through the material does not endow it for use with various modes of spectroscopy where real-time imaging applications have been developed. For example, optical or infrared spectroscopy of the microfluidic device, through an optically transparent window, could provide readout of the types and concentration of fluorescent reporters within the growth chamber, which are usually correlated with gene expression or molecular binding events. Thus, there is a need for an optically transparent window for microfluidic cell culture device with the necessary mechanical strength, and which enables both optical and infrared imaging and spectroscopy to be performed. To this end, a flexible optically transparent polymer, poly(ethylene terephthalate), PET, could serve as the optical window of a microfluidic cell culture device. Given its optical transparency and flexibility, the PET thin film could be layered on an imaging area of a PDMS microfluidic device, that allows for optical and infrared imaging and spectroscopy. Thus, using readily available PET thin film, an optically transparent window could be placed on a PDMS microfluidic growth chamber for imaging or spectroscopy in the optical and infrared spectrum. Interested researchers may want to expand on the idea presented here.

Keywords: microfluidic growth chamber, optical imaging, optical transparency, infrared spectroscopy, poly(ethylene terephthalate), poly(dimethyl siloxane), cell culture, fluorescent reporters,

Subject areas: bioengineering, biotechnology, biochemistry, cell biology, molecular biology,

Conflicts of interest

The author declares no conflicts of interest.

Author's contribution

The author thought about the idea of using PET as a transparent optical window of PDMS microfluidic cell culture device for facilitating optical and infrared imaging and spectroscopy studies of various cells cultured within the device. He wrote the abstract preprint to share his idea with the scientific community.

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