A temperature control method for shortening thermal cycling time to achieve rapid polymerase chain reaction (PCR) in a disposable polymer microfluidic device

We present a temperature control method capable of effectively shortening the thermal cycling time of polymerase chain reaction (PCR) in a disposable polymer microfluidic device with an external heater and a temperature sensor. The method employs optimized temperature overshooting and undershooting steps to achieve a rapid ramping between the temperature steps for DNA denaturation, annealing and extension. The temperature dynamics within the microfluidic PCR chamber was characterized and the overshooting and undershooting parameters were optimized using the temperature-dependent fluorescence signal from Rhodamine B. The method was validated with the PCR amplification of mecA gene (162 bp) from methicillin-resistant Staphylococcus aureus bacterium (MRSA), where the time for 30 cycles was reduced from 50 min (without over- and undershooting) to 20 min.

General information
State: Published
Organisations: Department of Micro- and Nanotechnology, Magnetic Systems, National Food Institute, Division of Food Microbiology, BioLabChip, DELTA - a Part of FORCE Technology
Number of pages: 9
Publication date: 2013
Peer-reviewed: Yes

Publication information
Journal: Journal of Micromechanics and Microengineering
Volume: 23
Issue number: 7
Article number: 074002
ISSN (Print): 0960-1317
Ratings:
BFI (2019): BFI-level 1
Web of Science (2019): Indexed yes
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Scopus rating (2017): CiteScore 2.02 SJR 0.554 SNIP 0.968
Web of Science (2017): Impact factor 1.888
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 1.74 SJR 0.63 SNIP 1.067
Web of Science (2016): Impact factor 1.794
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): CiteScore 1.96 SJR 0.687 SNIP 1.265
Web of Science (2015): Impact factor 1.768
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): CiteScore 1.84 SJR 0.802 SNIP 1.316
Web of Science (2014): Impact factor 1.731
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): CiteScore 1.74 SJR 0.737 SNIP 1.233
Web of Science (2013): Impact factor 1.725
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): CiteScore 1.92 SJR 0.936 SNIP 1.491
Web of Science (2012): Impact factor 1.79
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): CiteScore 2.43 SJR 1.036 SNIP 1.443
Web of Science (2011): Impact factor 2.105
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 1.013 SNIP 1.637
Web of Science (2010): Impact factor 2.281
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 1.144 SNIP 1.5
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 1.243 SNIP 1.616
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 1.422 SNIP 1.815
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 1.264 SNIP 2.098
Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 1.165 SNIP 2.073
Web of Science (2005): Indexed yes
Scopus rating (2004): SJR 1.057 SNIP 1.881
Web of Science (2004): Indexed yes
Scopus rating (2003): SJR 1.416 SNIP 1.579
Web of Science (2003): Indexed yes
Scopus rating (2002): SJR 1.103 SNIP 1.507
Web of Science (2002): Indexed yes
Scopus rating (2001): SJR 0.763 SNIP 1.651
Web of Science (2001): Indexed yes
Scopus rating (2000): SJR 0.741 SNIP 1.011
Scopus rating (1999): SJR 0.742 SNIP 1.052
Original language: English
DOIs:
10.1088/0960-1317/23/7/074002
Source: dtu
Source-ID: n:oat:DTIC-ART:iop/388261230::29468
Research output: Research - peer-review > Journal article – Annual report year: 2013