

Engineering

Safe temperature thresholds for #2 HDPE and #5 PP plastic

Asked 2 years ago Modified 1 year, 9 months ago Viewed 3k times



It would be convenient to use a temperature adjustable heat plate (element)/mug warmer for the massive amount of blender bottles accumulated over the years.

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What are safe thresholds to safely warm the contents in seemingly, relatively safe plastic containers, BPA- and Phthalate-free, without leaching chemicals into the contents. Is plastic even a safe or effective, heat conductor long term?



It seems the type of plastic they use is made with High-density polyethylene ([HDPE](#)) & Polypropylene ([PP](#)). The melting point of HDPE and PP is respectively 267.44°F and 340°F. High-density polyethylene is a relatively poor heat conductor with a value of .42-.51. Porcelain and better yet Stainless steel have much higher thermal conductivity values, 1.40-2.27 and 16.3-24 respectively.

Not sure if this is a more suitable question for the other stack sites (i.e. Coffee, Seasoned Advice or Physics), it seems most aligned with a chemical/materials engineer.

materials

heat-transfer

chemical-engineering

plastic

product-engineering

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edited Aug 19, 2020 at 13:07

asked May 12, 2020 at 17:55



[user289394](#)

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Safe temperature to do what? Keep hot drinks in? – [Solar Mike](#) May 12, 2020 at 18:02

temperature to heat contents in the container without leaching chemicals into the contents. – [user289394](#) May 12, 2020 at 18:07

So, tepid, lukewarm, boiling? – [Solar Mike](#) May 12, 2020 at 18:08

120-140°F seems like a suitable temperature range to drink coffee/tea. – [user289394](#) May 12, 2020 at 18:22

2 Extractables and leachables are also a function of the fluid that the container is exposed to. I'd be curious to know how well the containers you have, assuming they weren't originally designed to be heated and cooled, would deal with the fatigue of thermal cycling. – [J. Ari](#) May 13, 2020 at 3:11

1 Answer

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Generally I would recommend against heating a plastic container with a resistance heater (like a hot plate or mug warmer) unless you know for a fact it has a hardware shutoff that will kick in well below the melting point. Hardware failures do happen, and I've personally seen a runaway hot plate almost melt an unattended plastic container (full of alcohol!).



That being said, it depends on your risk tolerance. Generally I avoid heating food or drink in containers not designed to be heated. Even if they are labeled BPA-free, some manufacturers have simply switched to using other bisphenols like [bisphenol S \(BPS\)](#), which apparently act in the body in a similar way to BPA but are chemically distinct, allowing the manufacturers to still use the BPA-free label. To be fair, BPS seems to be a bit more heat-stable than BPA, but still. I would bet that even some plastic products *designed* for heating food in have this issue.

All that said, there's not much you can do to get away from endocrine disruptors entirely. Even if you managed to avoid all plastic in the kitchen, they're just in the environment at this point. So given that you are already being exposed to them, whether you want to be concerned about ingesting some more by heating your food in plastic containers is up to you. If it's much more convenient and you don't care that much, go for it. If you're concerned about the health implications and it would only save you a bit of effort, probably not worth it.

Finally, I'm not an expert nor a doctor—I would advise doing some research on the health effects yourself, since I can't really speak to those with any more authority than Wikipedia.

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answered Jun 12, 2020 at 18:42



realityChemist

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