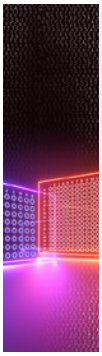

Five Things to Consider Before Buying Your Next PCR Plate

By Jennifer Placek

Have you ever considered how your PCR plate might affect your results? PCR plates are often overlooked during experimental setup but are just as crucial to the outcome of your experiment as the reagents and instruments you use. Before you set up your next PCR experiment, there are five essential questions you should ask yourself.

How Tall Should Your Plate Be?

Have you ever pulled your PCR plate from your thermal cycler and noticed empty wells, condensation on the seal or cap, or crushed wells that bulge in the middle? These are all problems that can result if you use a PCR plate that is the wrong height for your thermal cycler. Standard PCR plates will be either 20.7 mm high (high-profile) or 15.5 mm high (low-profile), as seen in Figure 1. Understanding your instrument's plate requirements and the lid mechanism will help you choose the right plate.

The lid of a thermal cycler or real-time PCR instrument contains a heated plate assembly that sits down on the PCR plate when the lid is closed, applying a specific amount of pressure to the caps or seal on a plate. Using a plate that is too tall for an instrument will cause too much pressure to be applied to the plate and cause the wells to compress during thermal cycling. In contrast, using a low-profile plate in an instrument designed for taller plates will result in insufficient pressure being applied. This, in turn, may result in sample condensation or evaporation.

Instruments with adjustable lids are compatible with both high- and low-profile plates. One common identifying feature of these instruments is a wheel you can turn to tighten or loosen the lid. Some instruments automatically detect and adjust to different plate heights. These instruments give you the flexibility to select the best plate for your application. Alternatively, instruments with fixed-height lids can only be used with appropriately sized plates. Identifying your instrument's lid and plate specifications will help you to limit issues with your sealing method and avoid crushing wells.

Bio-Rad™ offers a diverse PCR plate selection that includes high- and low-profile plates to meet your instrument needs. Use our PCR Selector Guide at **bio-rad.com/PCRPlasticSelector** to choose the best plate height for your instrument.

Fig. 1. PCR plate height. Choose between low-profile and high-profile PCR plates based on your PCR instrument's dimensions.

Does Your Plate Need a Skirt?

On a PCR plate, the skirt is the outer frame of the plate, providing plate rigidity and a flat surface for robotic plate handlers to grip. PCR plates have three different skirt options: unskirted, semi-skirted, or full-skirted (Figure 2). The frame of an unskirted plate stops at the edge of the plate and does not have a vertical surface. Semi-skirted plates have a vertical surface that extends roughly halfway down the length of the wells. And a full-skirted plate has a vertical surface that extends the entire length of the wells and will rest on a bench.

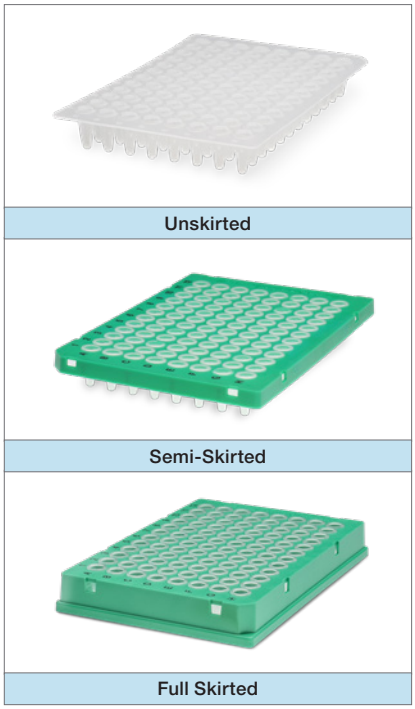

Fig. 2. PCR plate skirt options. Decide what skirt options will best meet your needs based on your thermal cycler design.

The correct skirt length to use depends on your thermal cycler. Some cyclers encase the thermal block in the deck of the instrument, leaving no room for a skirt. Other instruments position the thermal block in open space, allowing for the use of semi- and full-skirted plates. If using automation, the PCR plate must have a semi or full skirt, which provides a surface for the robot to grip.

Bio-Rad Hard-Shell™ PCR Plates have semi- and full-skirted options with a rigid frame designed to use with automation platforms. Browse our brochure at **bio-rad.com/HSPbrochure** for additional information on Hard-Shell PCR Plates.

What Color Wells Should Your Plate Have?

Did you know that the color of your PCR plate's wells can affect your real-time PCR results? PCR plates come in various well colors, the most common being clear or white (Figure 3). Each has distinct advantages and disadvantages which should be considered when choosing the right PCR plate for your experiment.

Clear-well plates are constructed using polypropylene with no added colors and thus are translucent. One advantage of clear wells is that they allow the user to visually monitor pipetting, as the sample volume can be observed from the bottom, sides, or top of the plate. Clear wells also allow you to see if a well has been missed or if volumes differ between wells. The main disadvantage of using clear-well plates is the possibility of fluorescence bleeding through. When the fluorescence signal from one well bleeds into a neighboring well, the results in the neighboring well will be artificially high. This situation is especially concerning when a sample with high fluorescence signal is adjacent to a sample with a low concentration of the target, as the bleed-through will artificially increase the signal coming from the low-concentration well.

White-well plates are constructed using polypropylene with white color added to the resin, resulting in opaque wells. Seeing which wells contain samples and the volume of the sample in each well is more challenging in white-well plates because you can see the sample only when looking down into the well. Adding an inert dye to the sample helps minimize this drawback. White-well PCR plates offer a significant advantage: they prevent light from escaping through the sides of the opaque wells, increasing the signal-to-noise ratio. This better signal-to-noise ratio is critical when amplifying and detecting a signal from low-concentration samples. The opaque wells also eliminate any potential bleed-through into neighboring wells.

Hard-Shell PCR Plates are available in white and clear wells. Use our PCR Plastics Selector guide at **bio-rad.com/PCRPlasticSelector** to select the right PCR plate for your application.

Fig. 3. Well color options. PCR plates come in an array of different options to fit a variety of experimental needs.

Does Your Plate Need a Rigid Frame?

Have you ever held a PCR plate by one edge and noticed that it is slightly floppy? PCR plates that easily twist and bend are challenging to handle — and may also impair the efficiency of your PCR reaction. If a PCR plate does not sit flat in a thermal cycler block, the wells may not make consistent contact with the block, resulting in uneven heating of your samples. Furthermore, a plate that does not sit properly in a thermal cycler block may twist or warp as it undergoes heating and cooling, causing caps or optical seals to become dislodged, resulting in sample evaporation. And, of course, a PCR plate that can easily contort is not compatible with robotic plate handlers, which require plates to have a predictable confirmation for the grippers to work. So, what is it about a PCR plate that makes it rigid?

PCR plates are manufactured using either a one-component or two-component design. One-component plates are made entirely of polypropylene resin and are manufactured using a single mold. Polypropylene resin is ideal for PCR plates, as it allows for the molding of thin-walled wells and is optimal for thermal transfer during PCR cycling. However, constructing both the plate frame and wells from this material has limitations. Polypropylene remains flexible and can undergo conformational changes when subjected to heating and cooling cycles during PCR. Uneven shrinking of the polypropylene frame will cause a plate to twist or warp, and this can cause the seal around the rims to detach. When this happens, the sample will evaporate, causing inaccurate results.

In contrast, PCR plates constructed using a two-component design are made with a polycarbonate frame and polypropylene wells. The frame is manufactured first, then the wells are molded into the frame. The advantage of using polycarbonate is that the frame can better withstand temperature changes, resulting in a rigid PCR plate less prone to warping. Since PCR plates constructed using a two-component design are rigid, the seal remains adhered to the plate, and samples are less likely to evaporate. This makes the two-component plate a much better choice for PCR assays.

If you use a robotic plate handler to improve efficiency, accuracy, and throughput, you will want to use a plate constructed using a two-component design. Two-component plates are ideal for automation, as the rigid frame provides a surface for the robot to grip and hold, enabling accurate movement and alignment of the plate onto thermal cycler blocks.

Hard-Shell PCR Plates are a two-component design and provide a robust, rigid frame made of a proprietary polycarbonate resin coupled with wells made of polypropylene. Using Hard-Shell PCR Plates ensures that plate dimensions remain consistent during thermal cycling, samples remain adequately sealed, and automation robots can easily grip the plate and transition it between locations before and after thermal cycling (Figure 4).

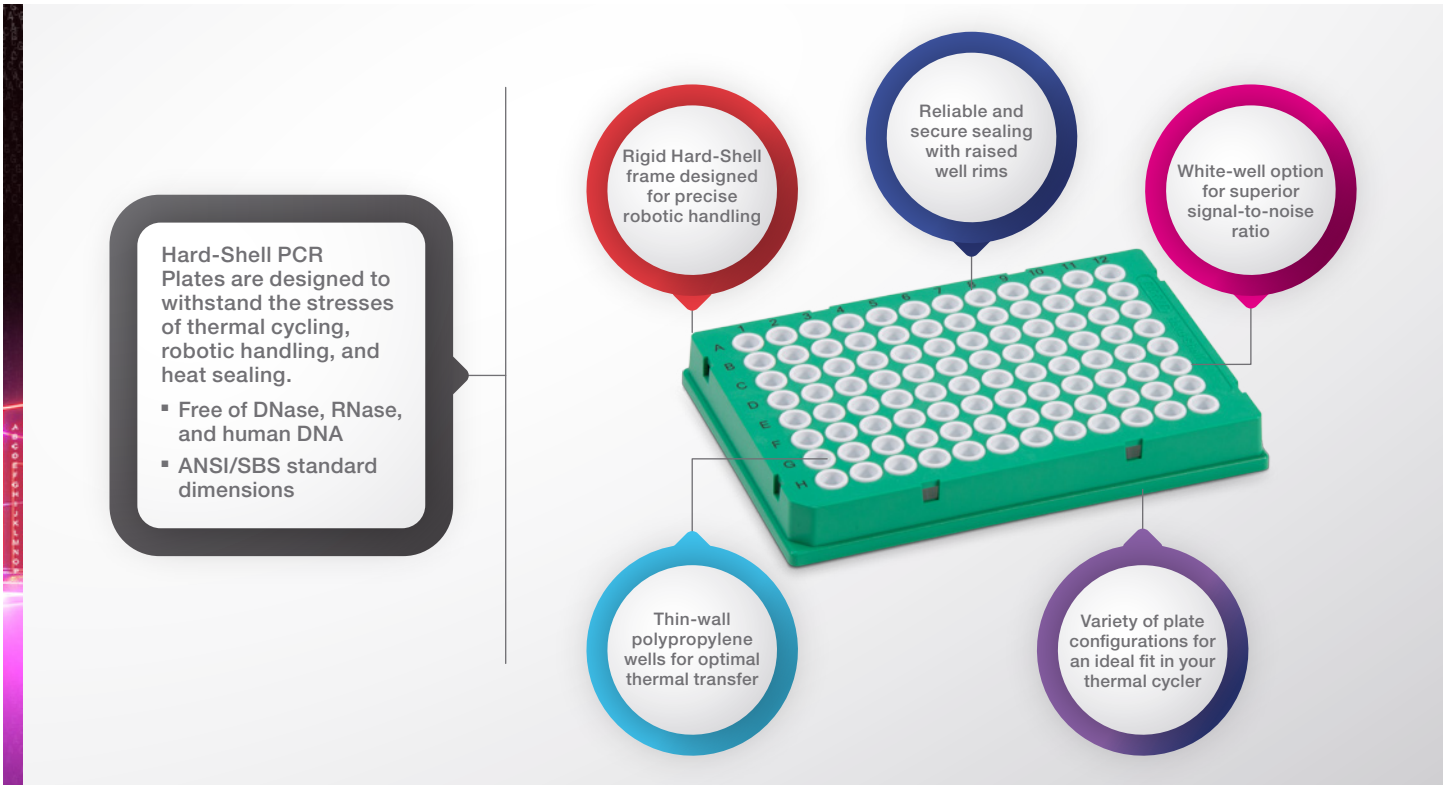

Fig. 4. The versatile nature of Hard Shell PCR Plates constructed using a two-component design. Every aspect of our Hard-Shell PCR Plates is designed for optimal performance. ANSI, American National Standards Institute; SBS, Society for Biomolecular Sciences.

Can You Trust Your PCR Plate Manufacturer?

You expect consistency in the performance of your PCR plates from plate to plate and lot to lot. Rigorous quality control standards are essential for consistently manufacturing high-quality PCR plates.

Bio-Rad ensures our products are of the highest quality before they arrive at your lab by requiring stringent testing throughout the manufacturing process. Our Hard-Shell PCR Plates are produced in our Manufacturing Centers of Excellence with International Organization for Standardization (ISO) 13485 certification, utilizing precision injection molding.

All aspects of our production processes are monitored to ensure the highest quality product, from testing raw materials through in-process and final product inspections. We inspect our PCR plates throughout manufacturing to ensure they are a consistent dimension, have low background fluorescence, and are defect-free. In addition, we provide a Certificate of Analysis (CoA) for every batch of PCR plates, indicating the batch is free from DNAse, RNAse, and human DNA.

Choose Your PCR Plate

Bio-Rad offers a variety of PCR plates to fit your needs, and we ensure each plate meets our stringent quality control specifications. When deciding where to purchase PCR plates for your next experiment, ask yourself: What plate height and skirt dimensions are compatible with my thermal cycler? What is the appropriate well color for my experiment? Will I need a rigid PCR plate that properly fits the instruments and automation platforms I will use? Do I trust that my PCR plates are being manufactured to the highest quality standards consistently? Once you have determined your needs, you're ready to order your plates.

Visit our PCR Plastic Consumables website at **bio-rad.com/PCRPlastics** to learn more about our PCR plates.

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