spinbar® The World's First Name in Magnetic Stirring
MAGNETIC STIRRING BAR SELECTION & USE

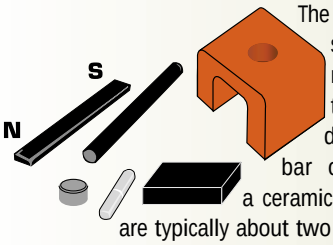
Matching the Drive and Stirring Bar Can Dramatically Improve the Results!

- Assured Quality
- Alnico V Permanent Magnet
- Seamless Molded Teflon® PTFE
- Polished Finish
- Leakproof Design
- FDA Approved Materials
- Specified Tolerance of Teflon® Walls
- High Strength Magnetization

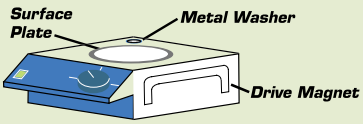
Magnetic stirring and mixing is used in a number of common laboratory procedures. The importance of selecting the best stirring bar for each particular application is often overlooked.

Varying the size, shape or length of the magnetic stirring bar will alter the motion imparted to the solution. Thus, selection of the appropriate stirring bar for a given application should be done with great care.

Understanding the principles of magnetism is important. On the most basic level, we are aware that opposite poles attract. However, we must also understand the significance of the drive element, magnetic coupling, "spin-out", vessel shape, viscosity and turbulence.



The drive motor of a magnetic stirrer provides the rotation necessary to spin the drive magnet. The drive magnet is generally a bar or "U-shaped" alloy or a ceramic disk. The magnetic poles are typically about two inches apart in bench top models. The poles can be up to six inches apart in units large enough to mix 50 gallons of liquid solution. For optimum efficiency and magnetic coupling, the distance between the magnetic poles of the drive magnet and the length of the stirring bar should be equal. Therefore, the drive magnet dictates the longest possible stirring bar that can be used effectively. A small metal washer moved around the surface plate of the stirrer will naturally gravitate towards one of the poles of the drive magnet. A small magnetic stirring bar will provide similar results.



Magnetic Stirrer

Another important parameter in choosing a magnetic stirring bar is the vertical distance between the drive magnet and the stirring bar. The material and thickness of the cover plate as well as that of the containing vessel can also influence stirring efficiency. Cover plates are made of paramagnetic materials such as ceramic or aluminum, which offer better coupling of the drive magnet and stirring bar. The magnetic energy is not impeded as it might be if the top were made of magnetic material. The amount of magnetic energy that joins the two magnets (coupling) falls off as the distance between them increases. Stated mathematically, "the coupling energy or force is inversely proportional to the square of the distance between them". It stands to reason that for the best magnetic coupling, the distance between the magnets should be minimized.

Magnetic stirring bars are generally made of ALNICO (an alloy of aluminum, nickel, iron and cobalt) encapsulated in an FDA approved PTFE coating. This combination offers the best compromise of magnetic strength, usefulness and cost. The PTFE coating is only useful at temperatures up to 225°C (437°F) Other coatings or coverings such as glass tubing, polypropylene and polyethylene are also used. More exotic materials have not been found to be commercially viable.

High energy materials, such as Samarium Cobalt and Neodymium Iron Boron, though having a much higher energy product (Bd x Hd) than ALNICO V, do not always work better as drive magnets. The geometry of the magnet, in the case of bar magnets, length/diameter (L/D), governs how effective the magnet will be. The aforementioned magnets have energy products of three to six times that of ALNICO V in geometry of 1 to 1. When used in a 4 to 1 configuration, their relative levels are nearly the same or less than the ALNICO V. Additionally, many of the exotic materials are extremely temperature sensitive and will demagnetize as the temperature increases.

Once a magnetic stirring bar has been placed in a container with a solution, it should be positioned directly over the center of the drive magnet. The stirring speed should be increased slowly, until the desired vortex pattern is achieved. Should the magnetic stirring bar lose its coupling with the drive magnet because of the speed of the drive magnet or the viscosity of the fluid, it is said to have "spun-out". Improperly selected stirring bars are the frequent cause of "spin-out", as well as a drive magnet speed that is too fast. Matching the drive and stirring magnet improves results dramatically. The selection of the shape of the magnetic stirring bar also influences the resulting vortex.