

A Low-Cost Auto-Stop Hydraulic Press for Making KBr Discs

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The standard laboratory-type high-pressure hydraulic press for making KBr discs in infrared study is expensive and heavy. The hand-held model that utilizes only wrenches and screws produces discs of small diameter, 5 mm or less. Here a low-cost press is introduced (Fig. 1). It is constructed from a hydraulic jack of 15-ton capacity and an adjustable torque wrench, both of which are readily available in most local hardware stores. The stand is made of steel bars and U-channel steel by welding them together. The front end of the adjustable torque wrench should be modified or replaced with a proper steel rod so that it will fit the pump lever tube of the hydraulic jack. Since the adjustable torque wrench functions only in the tightening action on a screw, it should be inserted in the pump lever tube in the correct position so that to pull down at the handle is similar to the tightening action.

The first time this device is used, one should start from the low torque setting and gradually increase the force at each try until a clear KBr disc results. There are several advantages in using this device:

1. The special high-pressure gauge, which is expensive and not readily obtained, can be eliminated.
2. Reproducible results can easily be obtained.
3. The lever of the platform in the hydraulic jack can be raised very quickly by hand rotation; therefore a few pumping actions by the lever are sufficient to reach the required pressure. Raising the jack platform by hand rotation is also very handy in removing the KBr disc from the die.
4. Most adjustable torque wrenches have a locking feature to fix the torque at the predetermined setting, which is difficult to alter inadvertently. Therefore an overforce, possibly causing damage to the die set, can be avoided.

The total material cost in construction of this press is about U.S. \$100. The cost of the adjustable torque wrench can vary widely, from less than \$20 to more than \$100. Since high precision is not needed and only good reproducibility is important in this application, the low-cost unit can satisfy this purpose. The torque wrench can also be adapted to the standard laboratory hydraulic press (Fig. 2). There is no need, for good reproducibility, to watch the gauge when making the KBr disc.

To operate the torque wrench correctly, the instructions that come with it should be followed. The actual force applied to the pump in the hydraulic jack depends on the length of the lever at the horizontal position. Therefore, for good re-

producibility, one should raise the lever each time to approximately the same angle from the horizontal. If many sets are needed it would be advantageous to recalibrate the modified specific torque wrenches of the same design by using a high-pressure gauge connected to the hydraulic jack. Then the force produced at the platform of the hydraulic jack can be read from the setting on the torque wrench. This may be useful in other applications.



Figure 1. (a) The assembly of the hydraulic press. 1: The height of the platform can be changed by rotation. 2: A screw has been placed at the pump lever tube to define the position for the adjustable torque wrench insertion. (b) The adjustable torque wrench. 3: The front end has been modified with a steel rod in which a groove has been cut to mark the proper position for inserting the hydraulic jack into the pump lever tube. This enables the torque wrench to function properly at the pulling-down action.



Figure 2. The modified standard laboratory hydraulic press. The original lever has been replaced by an adjustable torque wrench.