A new zircon concentrating table designed for geochronologists

Trevor Dumitru
Jasper Canyon Research Inc., Palo Alto, California
trevor@jaspercanyon.com

In order to separate zircon and other heavy minerals, many geochronology labs use Wilfley and Gemini tables designed for gold miners. However, the needs of miners and geochronologists are obviously quite different. We are developing a new table specifically for geochronologists.

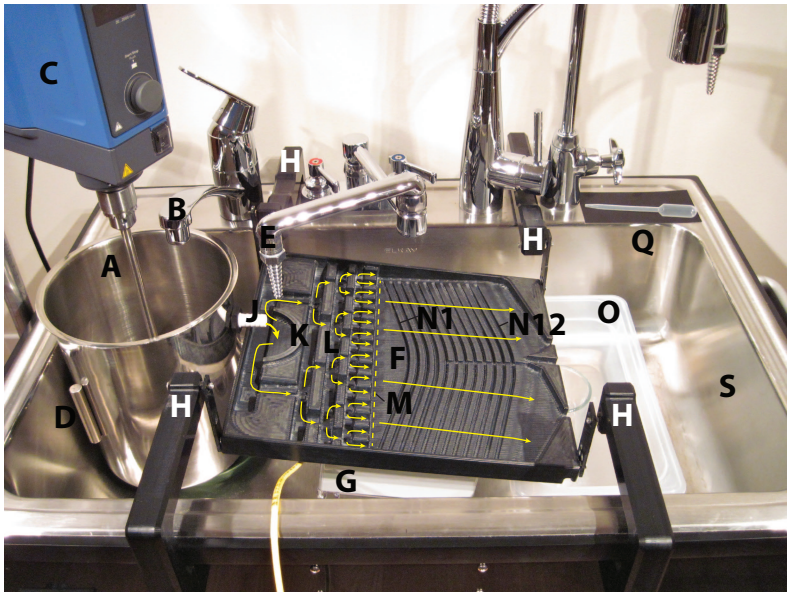
Geochronologists typically would like to recover roughly 200 to 5000 zircon grains from a rock sample. This is a tiny volume that is orders of magnitude smaller than the volume targeted by miners. The new design exploits this key difference by capturing the tiny volume of zircon inside four short grooves on the table surface and then simply holds the zircon inside those grooves until the sample run has finished. This contrasts with gold tables, which are designed to move heavy grains down long grooves, off the table, and into collection cups. This change allows a much smaller table surface, roughly one-tenth of the area of a typical gold table. Other components can then also be much smaller and the resulting instrument is compact and fits on top of an ordinary lab bench.

Prototype units are now capturing >80% of free zircon grains and concentrating them in a heavy fraction which has a very small total volume of 1 to 5 milliliters, much smaller than with traditional tables. This fraction may then be processed using standard Frantz and methylene iodide (MEI) methods to purify the zircon.

The small volume of the heavy fraction simplifies the MEI step and we suggest running MEI in small disposable tubes rather than separatory funnels. Examples of these tubes are on display.

Other features of the new design include an automated sample feeder that allows the instrument to run unattended, a magnet system in the feeder that removes iron fillings shed from the rock grinder plates, integral wash-down hoses that speed cleaning, and numerous details optimized for a lab setting.

Selected details:
•Available for sale in early 2017.
•Cost ≈US$18500.
•Ships worldwide by standard air express services.
•Size of black case is ≈81 wide x 58 deep x 36 cm high; additional clearances needed for arms, guages, faucets, etc.



How it works

Crush & grind your sample using standard methods (e.g., Bico disc grinder). For most samples, there is no need to sieve.

Pour entire sample into 8-liter feeder pot (A), add ≈3 liters of water from faucet (B), and start stirrer (C). Stirrer will mix sample and water together into a suspension. A magnet (D) is used to remove iron filings shed from your grinding plates from this suspension.

Start microprocesser (not yet installed), which controls water flow rates from faucets B and E. Faucet B will slowly add water into pot A, causing sample+water suspension to slowly overflow and exit out of outlet (J) and onto "slab" (F) . This process to auto-feed the sample will continue for 10 to 200 minutes, depending on sample size. You may leave the room and the instrument will run unattended.

A low voltage motor (inside waterproof box G) vibrates the slab. Four small arms and hangers (H) support the corners of the lightweight slab and pivot to accomodate the vibration motion.

Sample+water suspension spills out of outlet J and drops inside curved dam (K) on slab. Faucet E adds water to dilute the suspension. A network of branching grooves (L) spreads out the sample and water so they are evenly distributed in a thin layer when they flow across reference line M.

About 70% of zircon will be captured and will stay inside the first collector groove (N1). Most of remaining zircon will be captured by the next three grooves (N2, N3, N4).

Most of the apatite will be captured by the twelve collector grooves (N1-N12). Note that we are not yet satisfied with the recovery of apatite. We are still working to optimize groove configurations, slab angles, vibration intensities, water flow rates, and other parameters for apatite.

Light grains are deposited in plastic tray (O). Water overflows out of the tray and eventually exits instrument via drain pipe (P), which leads to an ordinary sink in your lab.

After run is completed, you use a disposable plastic pipette (Q) to vacuum zircon fraction out of grooves (N1-N4) and put it into a beaker.

For cleaning, there is a washdown faucet (R) and the slab and other parts are easy to remove. The entire sample flow path is built inside a large stainless steel sink (S).

Other parts not mentioned above:
T vibration speed controller (low voltage, waterproof)
U vibrator motor power cord (low voltage, waterproof)
V two water flow rate guages with adjusting valves
W adjustable leveling feet