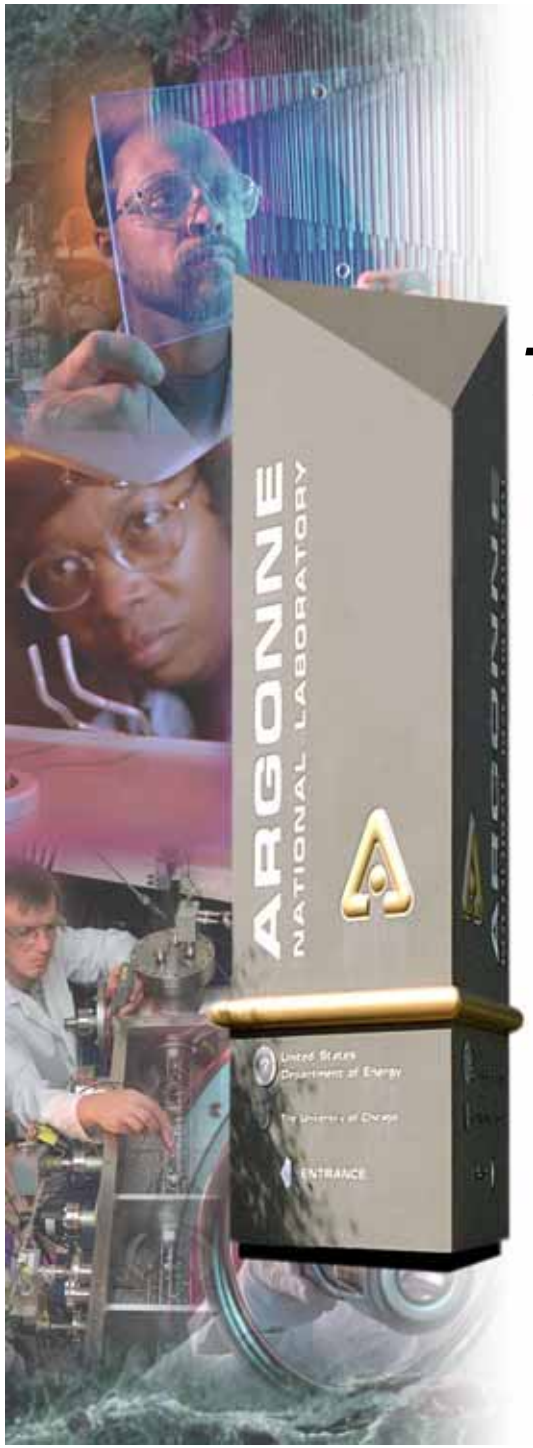

Thermoxid Sorbents for the Separation and Purification of ^{99}Mo

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Purpose

- **To evaluate the effectiveness of Thermoxid sorbents in acidic ^{99}Mo processes**
- **To compare the K_d values obtained with Thermoxid sorbents to the K_d values obtained for alumina**
- **To determine if the Thermoxid sorbents are good alternatives to alumina for the recovery and purification of ^{99}Mo from acidic, U-rich solutions.**

Background-Alumina Sorbent

- **Commonly used in acid-side ^{99}Mo processing**
  - IRE, Nordion, ANSTO
- **Retains Mo from acidic solution**
- **Elutes other FP's**
- **Stripped with $NH_4(OH)$**

Background-Thermoxid Sorbents

- **Thermoxid R-1 and R-2 are inorganic sorbents**
- **Manufactured by:**

  Thermoxid Scientific and

  Production Company

  Zarechnyi, Russia
- **Distributed internationally by:**

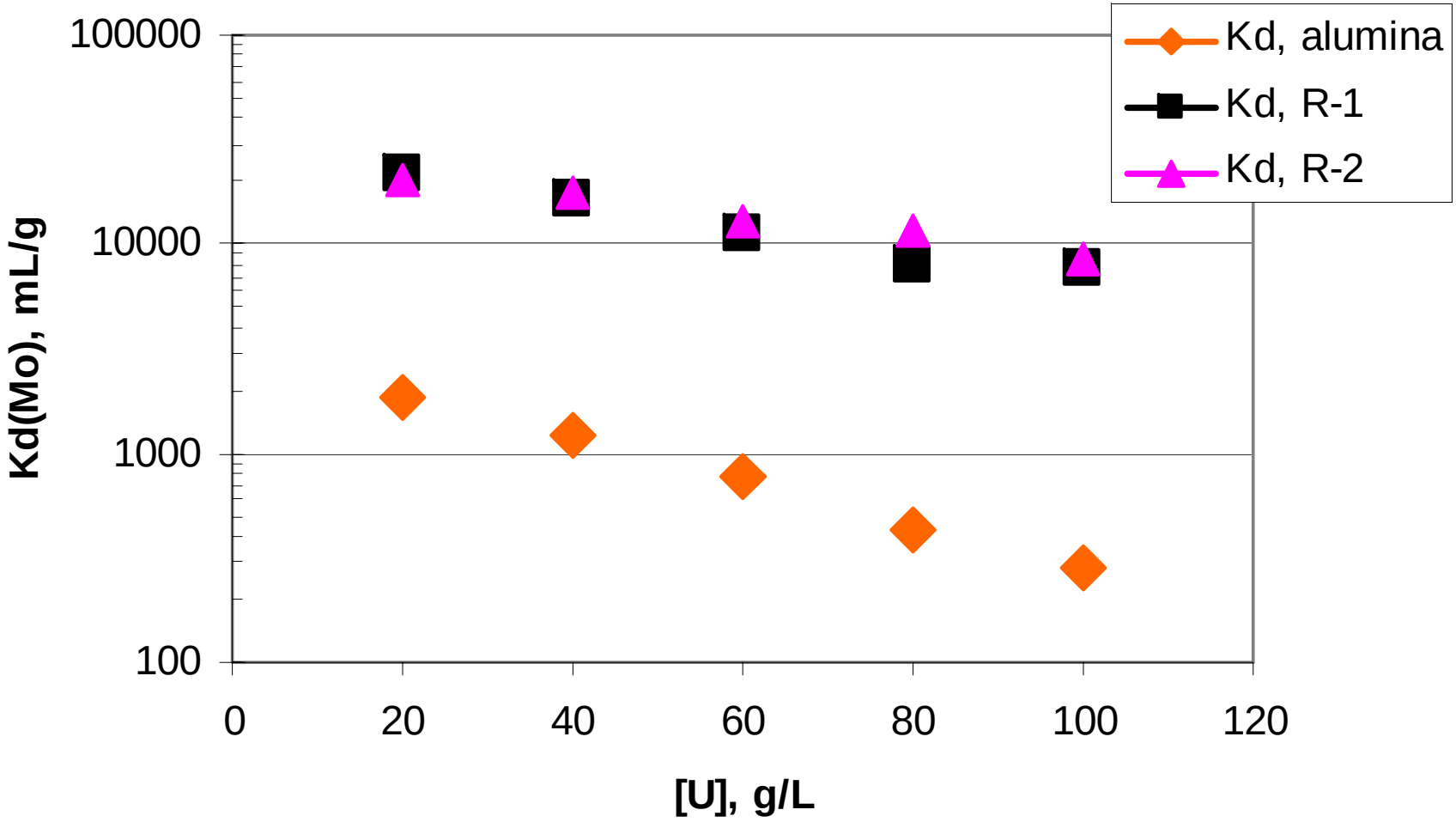
  TCI Medical

  Albuquerque, NM
- **Designed specially for ^{99}Mo recovery and purification at high uranium concentrations**

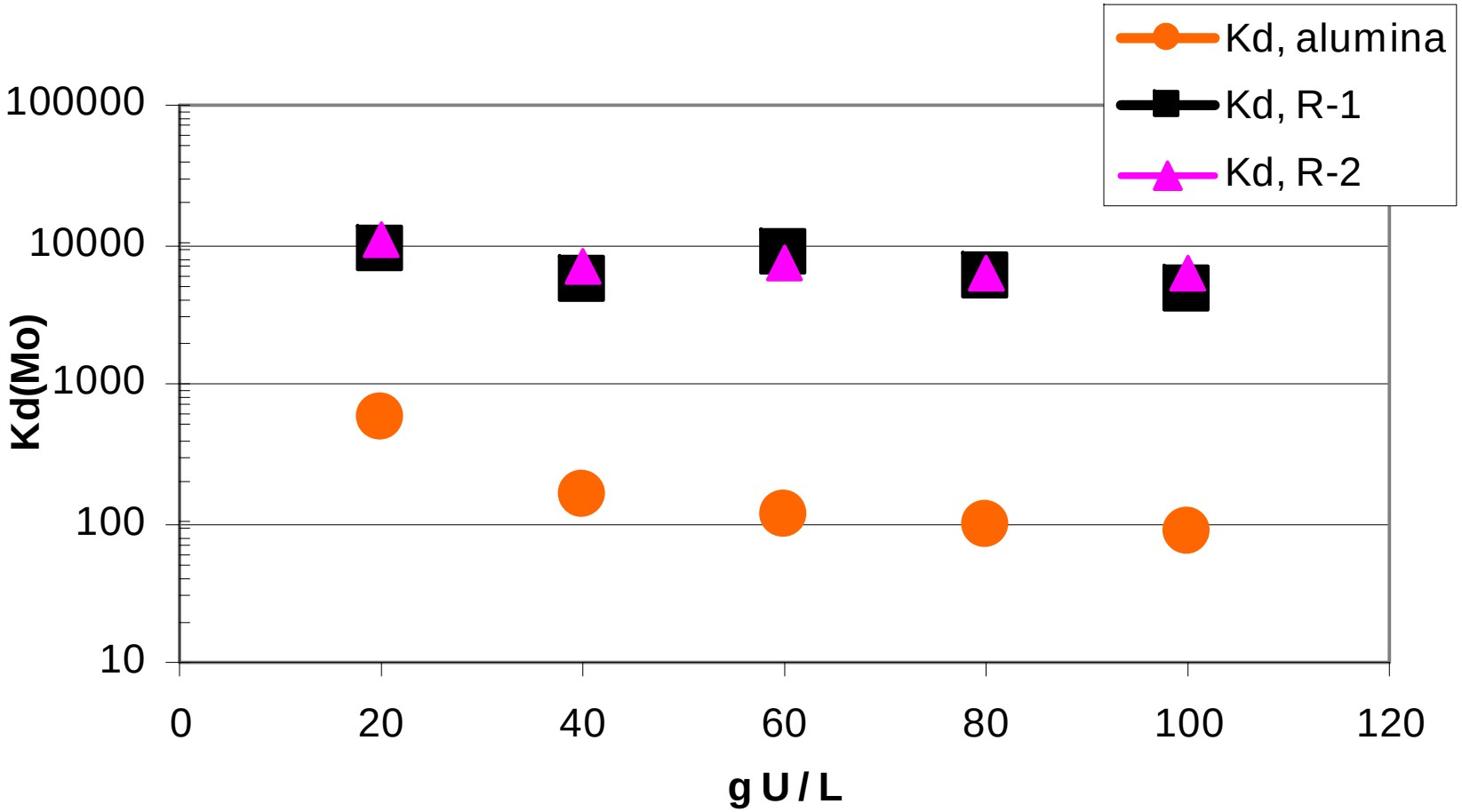
^{99}Mo Partitioning Coefficient - K_d

- **K_d is a measure of the effectiveness of a sorbent for removing a species from solution**
- **Ratio of the concentration of a species on the sorbent to that in solution, e.g., (Ci-^{99}Mo/g-solid) / (Ci-^{99}Mo/mL-solution)**
  - Typical units are mL/g
- **The higher the K_d, the more effective is the sorbent.**
  - K_d = 10,000, a column would act as a filter until saturated
  - K_d = 1000, a column would be robust and give excellent performance
  - K_d = 100, a process can be designed, but upsets would be a concern as conditions changed
  - K_d = 10, column performance would be poor, process upsets would be common, and its size would need to be very large

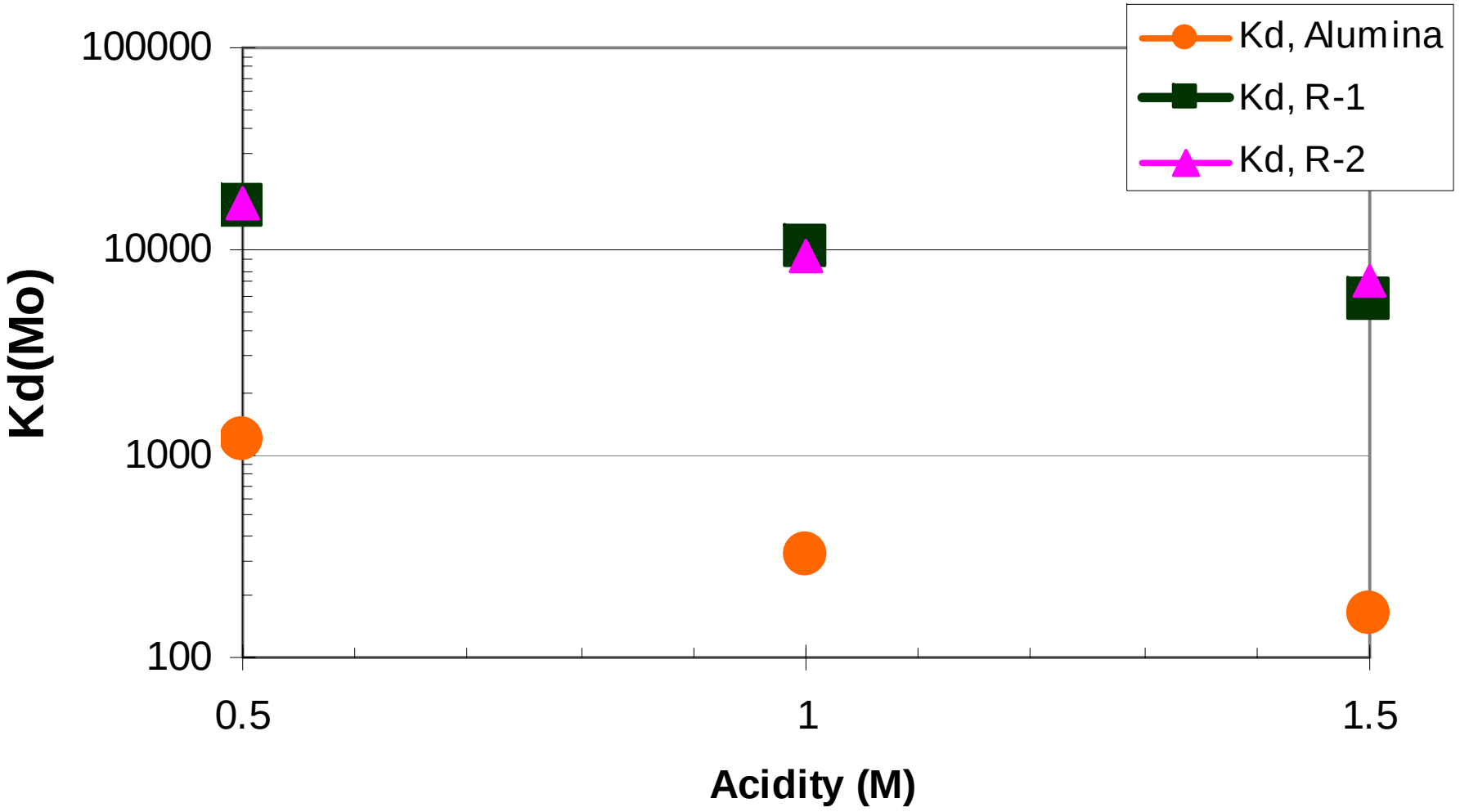
K_d vs. [U] (0.5 M acid)



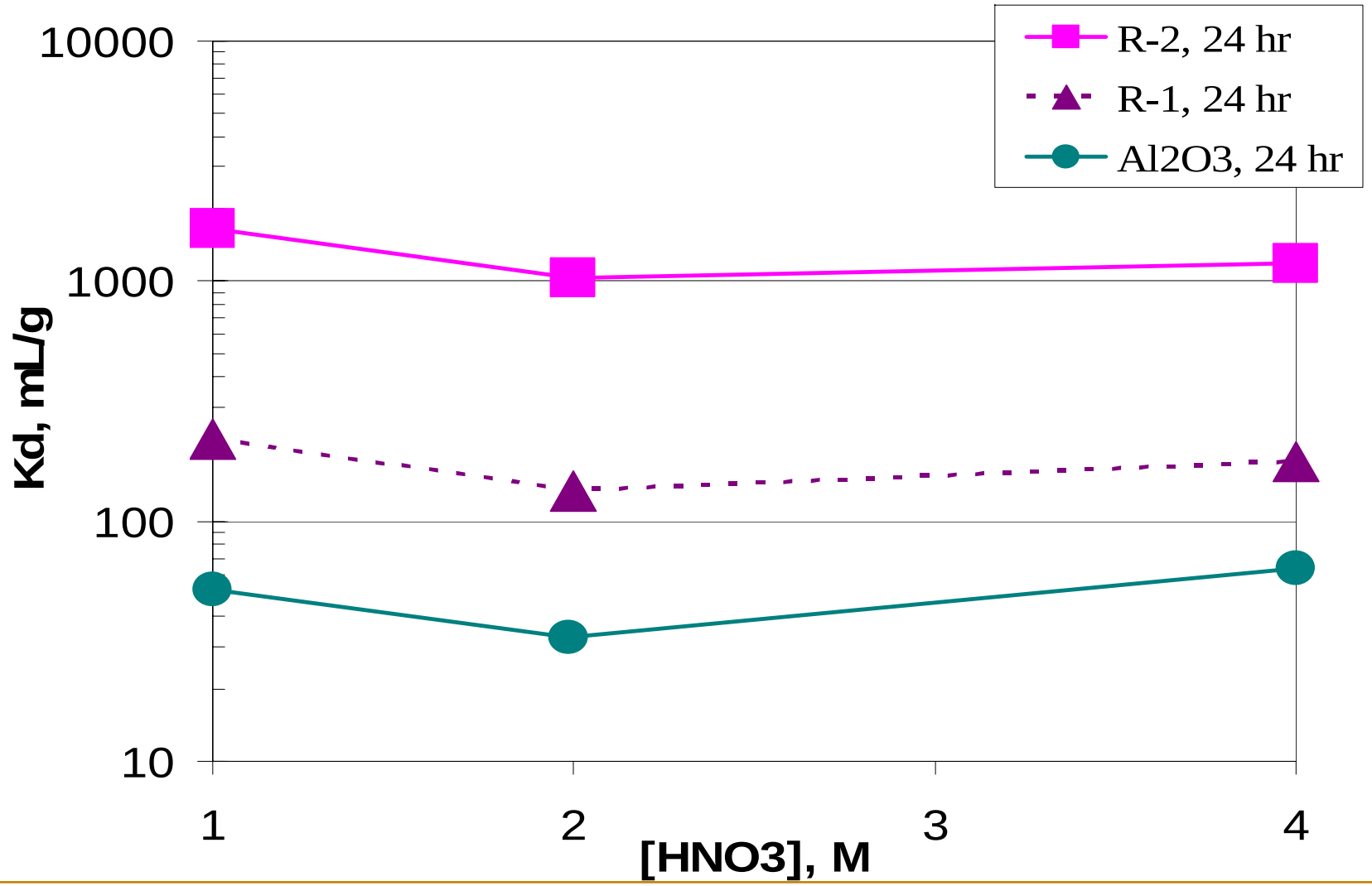
K_d vs. [U] (1.5 M acid)



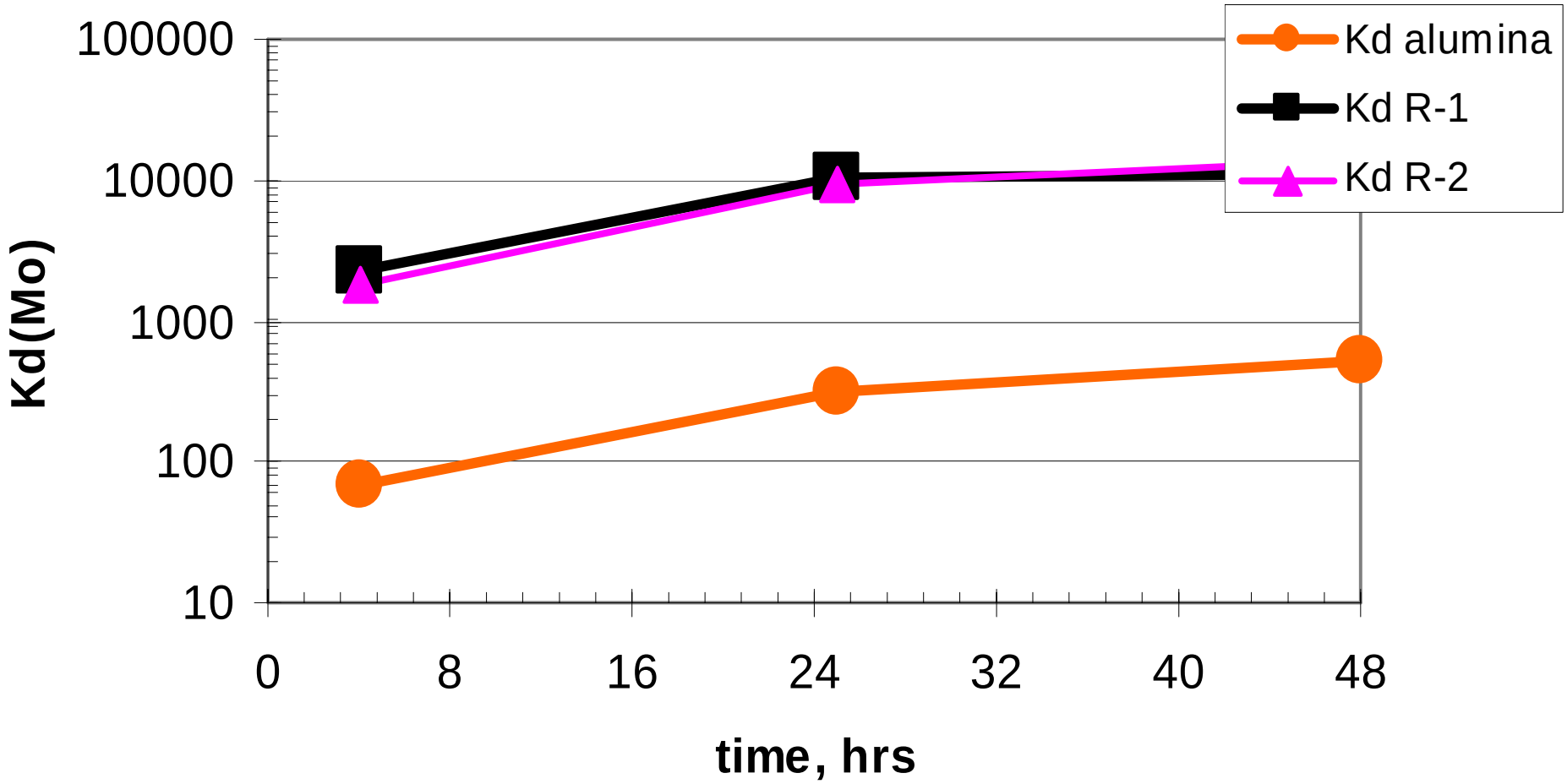
K_d vs. acidity (40 g U / L)



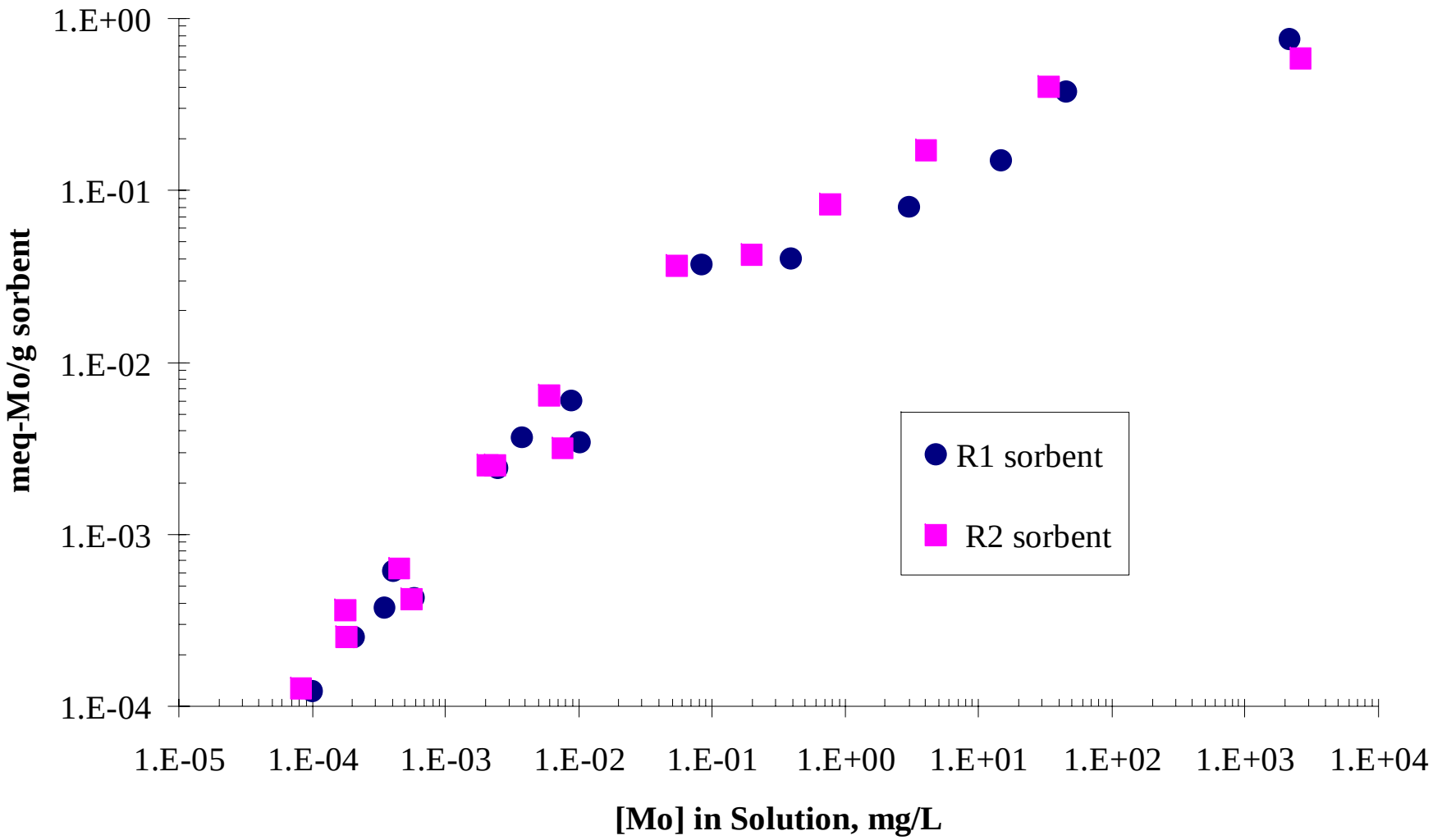
K_d vs acidity (320 g U / L)



K_d vs. time (1.0 M acid, 40 g U / L)



Molybdenum Loading of R1 and R2 Sorbents



Summary

- **Thermoxid sorbents show high K_d (^{99}Mo) values from acidic, U-rich solutions.**
  - Important for conversion to LEU due to the higher U concentration
- **Thermoxid sorbents show higher K_d (^{99}Mo) values (at least 10X) than alumina under all conditions.**

Future Work

- **Column tests are underway to determine the behavior of Thermoxid sorbents in dynamic systems.**
  - Capacity
  - Breakthrough behavior

Conclusions

- **The Thermoxid sorbents are potentially superior to alumina for the recovery and purification of ^{99}Mo from acidic, U-rich solutions**

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