Anesthesiology
48:78, 1978

In reply:—Our previous communication concentrated on removal of dilute anesthetic vapors by adsorption for which isothermal conditions are realized.[1] It was, however, pointed out that such behavior may not be valid for concentrated anesthetic due to non-separation of mass and heat transfer zones.[1,2] Cundy's example of 8–10 per cent ether belongs in this category. In such cases, the temperature of the carbon in the equilibrium section of the canister behind the transfer zones is higher than the feed gas temperature, and that reduces the effectiveness of the canister. External cooling of the canister will obviously improve its performance, but will necessitate jacketed metal canisters. In the absence of such facility, one should correct the equilibrium adsorption capacity for operation under non-isothermal conditions.

Calculation of the actual temperature increase inside the canister is complicated by the heat losses through the canister walls. The real situation lies intermediate between true adiabatic and isothermal conditions. However, a simple and safe approach is to use the adiabatic equilibrium capacity (n*) at the adiabatic temperature (T*), because this demands maximum adsorbent quantity. n* and T* can be calculated by a graphic procedure demonstrated in figure 1. It consists of 1) plotting the equilibrium adsorption capacity (n) for the anesthetic at different temperatures (T) corresponding to the feed partial pressure (p^0),[1] and 2) drawing a straight line of slope (C^s/q) originating from the point T^0 on the temperature axis. C^s is the specific heat of the adsorbent, q is the isosteric heat of adsorption for the anesthetic, and T^0 is the initial adsorbent temperature. The intersection of these two lines gives the values for n* and T*. Note from figure 1 that n* is smaller than n^0, the isothermal adsorption capacity, which shows that non-isothermal adsorption causes less efficient use of the canister.

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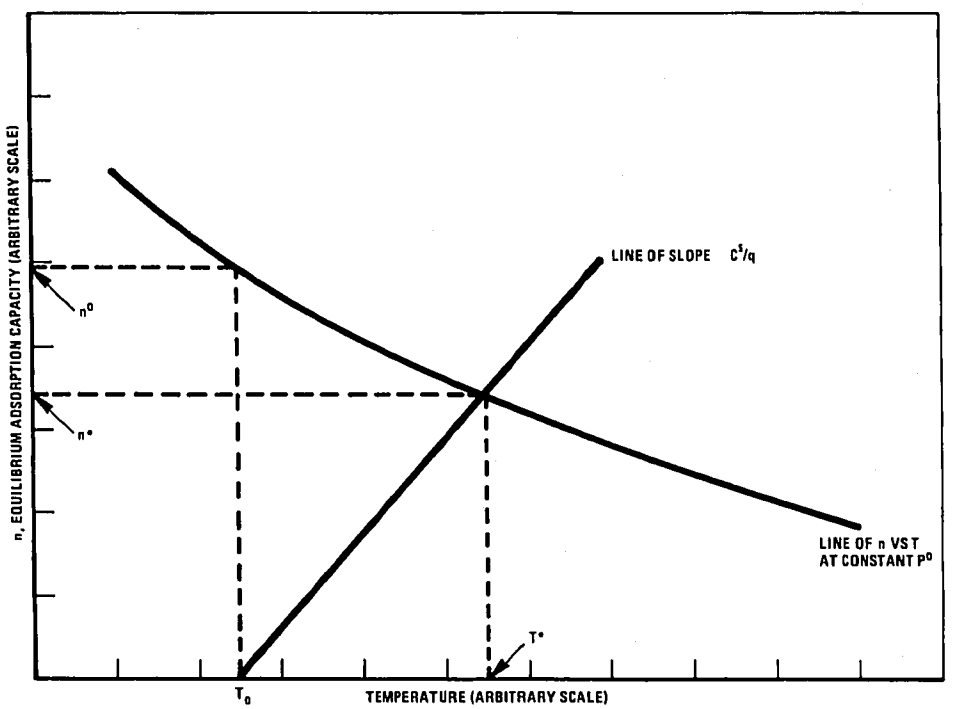

FIG. 1. Estimation of adiabatic equilibrium adsorption capacity.