vapor pressure of water in the cold part of the apparatus. The average results obtained for the Fe–H–O system may be summarized as follows:

Furnace temp., °C.	Solid phases	Steam–hydrogen ratio: In "cold end" (by pressure readings)	In "hot end" by analysis	In static expts. of Eastman and Evans	In flow expts. of Emmett and Shultz
700	Fe–FeO	0.57	0.41	0.584	0.422
800	Fe–FeO	.71	.48	.706	.499
900	Fe–FeO	.82	.55	.822	.594
1000	Fe–FeO	.97	.67	.937	.669
700	$FeO–Fe_3O_4$	1.50	1.19	1.45	1.181
800	$FeO–Fe_3O_4$	3.18	2.35	2.98	2.372

The obvious agreement between the "cold end" values (column 3) and the previous static results (column 5) on the one hand, and the "hot end" analysis (column 4) and the previous flow results (column 6) on the other, seems to show definitely that the principal cause of discrepancy between the various steam equilibrium constants for the Fe–H–O system is the factor of thermal diffusion. Since the magnitude of the steam–hydrogen ratios in the $Sn–H_2O–H_2–SnO_2$ system is about the same as for the $Fe–FeO–H_2O–H_2$ system, it is evident that the same diffusion factor will also account for the static experiments on the Sn–H–O system in which the steam–hydrogen equilibrium ratios are apparently about 40% high [THIS JOURNAL, **50**, 1106 (1928)].

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RECEIVED JULY 25, 1932
PUBLISHED SEPTEMBER 5, 1932

A FILM WHICH ADSORBS ATOMIC H AND DOES NOT ADSORB H_2

Sir:

We report the following brief study, which we shall discontinue for the present, because of its bearing on the subject of "activated adsorption."

A lamp had two pure tungsten filaments and one filament of Elinvar wire which contained 35% nickel and 12% chromium, the remainder being probably iron. The lamp was sealed to a vacuum system having liquid-air traps, and the Elinvar filament heated to a bright red heat in vacuum for fifteen minutes. The amount of metal thus evaporated was too small to be visible on the walls or to produce a change in resistance of the wire. Pure hydrogen was then admitted at a pressure of 0.250 mm. and one of the tungsten filaments was lighted at 2700°K., at which temperature 3.5% of the hydrogen molecules which strike a tungsten surface are dissociated. The hydrogen disappeared at an exponential rate, decreasing from 210 cu. mm. to 170 cu. mm. in 6.5 minutes.

The lamp was next evacuated and torched at about 450° for ten minutes, during which time water vapor given off by the glass walls presumably oxidized the metallic deposit. A second clean-up run then showed a much more rapid disappearance from 210 cu. mm. to 35 cu. mm. in 2.5 minutes, with log pressure varying linearly with time. The evaporation of a fresh film from the Elinvar wire, covering up previous films, always reduced the rate of clean-up to a low value, and subsequent torching of the tube restored the high value. In one run enough hydrogen disappeared in the film to form a layer 20 atoms deep while the rate of clean-up remained undiminished.

When the tungsten filament was turned off the pressure started immediately to rise. In one experiment 10% of the adsorbed hydrogen reappeared in ten minutes at 25°, and 90% in two minutes at 450°. Owing to this tendency of the gas to leave the film at a slow rate, the net rate of disappearance diminished markedly as the pressure fell below 0.020 mm. If the lamp was cooled in liquid air, the clean-up stopped instantly, showing that the catalytic effect of the cold film caused recombination of all impinging atoms. If H was adsorbed at 25° and the lamp then cooled in liquid air, there was no escape of hydrogen on turning off the filament. It is known that hydrogen evaporates as atoms from glass surfaces at 25° but recombines on cold glass, so it probably diffused as atoms to the deeper layers of our film at 25°. The film never showed any tendency to adsorb molecular hydrogen.

The recombination of atomic hydrogen at a *tungsten* surface is promoted by cooling the lamp in liquid air, due probably to the removal of water vapor. The H generated by a filament at 2700°K. delivered 0.63 watt to a neighboring tungsten filament with the lamp at 25°, and 1.48 watts with the lamp in liquid air, although cold walls lower the concentration of H in the gas phase by catalyzing recombination.

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Received August 10, 1932
Published September 5, 1932

NEW BOOKS

The Life and Work of Charles James, 1880–1928. Edited by Walter C. Schumb, Harold A. Iddles, Lyman C. Newell and Avery A. Ashdown. Published by the Northeastern Section of the American Chemical Society, A. A. Ashdown, Custodian, Massachusetts Institute of Technology, Cambridge, Massachusetts, 1932. 26 pp. Illustrated. 15.5 × 23.5 cm. Price, $0.50.

This memorial volume to Charles James contains, first, the Resolutions passed by the Northeastern Section on the occasion of his death; second, three essays, one on Charles James, the Man, by Melvin M. Smith, one on Charles James, the Teacher, by Lester A. Pratt, and one on Charles James,