However, it has not been quantitatively determined whether the hydrogen once absorbed during pickling could be perfectly driven off by the usual treatments, such as immersing in hot neutralizing solution, in hot water and drying below 100°C.

By the hot vacuum extraction method for the analysis of hydrogen in steel, the authors determined the quantities of hydrogen which remained in steel after the end of all the usual cleaning operations (pickling in 10 % H_2SO_4 soln. at 70°C for 5 min, neutralizing in Na_2CO_3 soln. at 70°C for 5 min, and drying at at 80°C for 3 min).

The initial quantities of hydrogen in steel which inherited from the steel manufacturing process were also determined with the sample which was only polished by the sand papers.

The test pieces used were the steel plates for enameling containing 0.05–0.10 % carbon, which are commonly used in Japanese enameling works.

The results of analysis are as follows, (1) When the steel plates are free from cavitites and blowholes, the quantity of hydrogen is about 2–4 c.c. per 100 g steel before as well as after the cleaning treatments, (2) When the steel plates have many cavities and blowholes found by microscope, the quantity of hydrogen increases nearly 3 times by the cleaning operations.

Therefore, the hydrogen once dissolved in steel during pickling operation can be completely driven off by the succeeding treatments, when the steel sheets contain no cavities which can be detected by microscope.

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53. Studies on the Manufacture of Roofing Tiles "Kusube Gawara". (IV)

Ikutaro Sawai and *Kiyoshi Terada.*

The authors have published a series of papers (J. Ceram. Assoc. (Jap.) **57** (635) 19; (636) 43, 1949) on the studies of Japanese "Daruma" kiln which is generally used for the manufacture of roofing tiles.

It was revealed that the water vapour, which is an efficient diluent of hydrocarbon vapours in smoking period, acts to eliminate the beautiful graphitic color when it comes in contact with the hot stock surface in the cooling period.

The authors made some investigations to find the source of water vapour, which flows into the completely enclosed kiln. By field work and model experiments it was ascertained that the water vapour came from the flues of the kiln, as in the usual construction the flue is not covered by refractories.

When the firing is repeated more than 7~8 times the temperature at the depth

of about 30 cm from the flue surface exceeds the boiling point of water and the vapourized ground moisture penetrates into the flue and comes into contact with the stock surface in the kiln.

Therefore, it seems that the carbon of the surface of smoking tiles is active and reacts with the water vapour in the kiln atmosphere. The reaction probably occurs at the temperature of 550°~600 °C.

Hence the authors recommend that the flue will be insulated by some means so that the ground temperature will not exceed a certain limit, below the boiling point of water.

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54. Studies on the Electrodeposition of Nickel. (II)

Kiyokado Nishihara and *Seizo Tsuda.*

When nickel is electrodeposited from its sulphate solution, there occurs an internal stress in the deposit which causes the deflection of the deposit.

In the previous report, the Report of the Inst. for Chemical Ressearch Kyoto Univ. Vol. 18 (July, 1949), we mentioned the influence of impurities in the solution on the degree of contraction of nickel deposit. Now we measure the influence of temperature on the deflection of deposit by means of contractometer. The degree of the deflection of the contractometer is found to decrease when temperature is raised from room temperature to about 70°C and to increase above 70°C.

The results of the measurement of hydrogen content occluded in the deposit and the parameter of electrodeposited nikel lattice from room temperature to 84°C are given in Table 1.

Table 1.

Temp. of Electrolyte (°C)	Quantity of occluded Hydrogen (cc/100g Ni)	Parameter by X-ray analysis (A)	Parameter by Electron Diffraction (A)
25	145.51	3.533	3.534
40	107.29	3.530	—
63	86.28	3.519	3.526
75	—	3.523	—
84	129.95	3.531	3.554

As shown in Table 1, the hydrogen content in the deposit and parameter measured by X-ray analysis, as well as by electron diffraction method have the same tendency and the minimum value at about 70°C. The parameter measured by electron diffraction method is always larger than that by X-ray analysis to the same sample.

It is concluded that internal stress in electrodeposited nikcl is minimum at the temperature of electrolysis about 70°C.