Workfunctions of Various Metals

In table 1 we give the values of E_W obtained from equation (9) for u_c equal to $1/\sqrt{3}$ as well as $1/\sqrt{6}$. We have computed for those metals which were considered by Smith

Workfunction Equation as Determined by Mehrotra & Mahanty

$$E_W = -(V + \Delta T)$$
$$= \frac{e^2}{2}\frac{\omega_p}{\beta}\int_0^{u_c} \frac{du}{[u + (1+u^2)^{1/2}]^2}$$
$$= \frac{3\mu}{(18\pi)^{1/3}}\frac{e^2}{a_0\sqrt{r_s}}$$

a_o = Bohr radius;
ω_p = plasmon frequency;
μ= numerical value for integral;
$\beta = (1/3)^{0.5}\, v_f$
v_f = Fermi velocity;
r_o = radius of equilibrium density distribution of free electrons;
r_s = electron density parameter defined by $no = \frac{3}{4}Pir_s^3a_o$;
ΔT = change in kinetic energy of electron added to surface of metal;
V = electrostatic energy due to external electron at surface;

Table 1. Comparison of the workfunctions for u_c equal to $1/\sqrt{3}$ as well as $1/\sqrt{6}$. Values with superscripts a, b and c are taken from Lang and Kohn (1971), Rivière (1969) and Smith (1969), respectively. r_s values are computed from the electron densities given by Smith (1969).

		Workfunctions (eV)			
		This work		Previous	Experimental
Metal	r_s	$u_c = 1/\sqrt{3}$	$u_c = 1/\sqrt{6}$	theories	
Cs	5·64	3·10	2·51	2·49[a]	2·14[a]
Rb	5·23	3·22	2·61	2·63[a]	2·21[a]
K	4·96	3·30	2·68	2·74[a]	2·39[a]
Na	3·99	3·68	2·98	3·06[a]	2·7[a]
Li	3·25	4·08	3·31	3·37[a]	3·1[a]
Ag	3·01	4·24	3·43	3·49[a]	4·0[a]
Au	3·00	4·25	3·44	3·49[a]	5·22[a]
Cu	2·67	4·50	3·65	3·65[a]	4·65[a]
Ca	3·26	4·07	3·30	3·11[c]	2·80[c]
Mg	2·65	4·52	3·66	3·66[a]	3·66[a]
Cd	2·59	4·57	3·70	3·36[c]	4·22[b]
Zn	2·30	4·85	3·93	3·80[a]	4·33[a]
Be	1·88	5·37	4·35	3·75[c]	3·905[b]
La	2·71	4·47	3·62	3·30[c]	3·3[c]
Tl	2·49	4·66	3·78	3·40 [c]	3·7[c]
In	2·41	4·74	3·84	3·44[c]	3·8[c]
Ga	2·20	4·96	4·02	3·56[c]	3·96[c]
Al	2·07	5·11	4·14	3·87[a]	4·19[a]
Sn	2·39	4·76	3·85	3·45[c]	4·425[b]
Pb	2·31	4·84	3·92	3·80[a]	4·01[a]
Ta	1·79	5·50	4·45	3·80[c]	4·22[b]
Nb	1·79	5·50	4·45	3·81[c]	4·37[b]
W	1·62	5·78	4·68	3·91[c]	4·55[b]
Mo	1·61	5·80	4·70	3·92[c]	4·21[b]
Re	1·50	6·01	4·87	3·98[c]	5·0[c]
Ir	1·41	6·20	5·02	4·02[c]	5·3[c]

Mehrotra & Mahanty, Free electron contribution to the workfunction of metals, J. Phys. C: Solid State Phys., Vol. 11, 1978.