

The irradiated samples were polished, etched and then tracks were counted under the same magnification. The estimation of neutron dose was made with the help of standard glass exposed to neutron flux simultaneously along with the rock sections.

The fission track age (T) and uranium concentration (C) of the apatite grains were determined using the following relations¹:

$$T = \frac{1}{\lambda_D} \ln \left[1 + \frac{\rho_s \phi \lambda_D I}{\rho_i \lambda_f} \right] \quad (1)$$

where λ_D , λ_f , ϕ , I are constants,

$$C = K_A \frac{\rho_i}{\phi} \quad (2)$$

ρ_s , ρ_i , ϕ are fossil track density, induced track density and neutron dose respectively. The experimental data on the fossil track densities, induced track densities and inferred ages are given in table 1.

The followings are the estimated neutron dose for the granites:

Umroi Granite (UG) = $(8.89 \pm 0.17) \times 10^{16}$ nvt

Myllem Granite (MG) = $(3.34 \pm 0.007) \times 10^{16}$ nvt

South-Khasi Granite (SK) = $(1.14 \pm 0.04) \times 10^{16}$ nvt

The age parameter from each thin section, shown in column 4 in table 1, is computed by adding the fossil tracks, the induced tracks and the corresponding areas on all the grains in the section. This was done to reduce the statistical error⁴.

The final result of the present study shows that the average apatite ages of the Umroi granite, the Myllem granite and the South-Khasi batholith are (754 ± 25) m.y., (767 ± 19) m.y. and (737 ± 28) m.y. respectively. The U-conc. as obtained in the present experiment is shown in the column 6, table 1.

It may be pertinent to mention that there is no geochronological data on the Umroi granite and the South-Khasi batholith. However, Crawford⁵ determined the age of the Myllem granite by Rb/Sr method and found to be (765 ± 10) m.y. The present study shows that the three granite plutons of separate occurrences may be linked with the same cycle of igneous activity.

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HYPERCONJUGATIVE EFFECTS OF BROMINE IN SOME P-BROMOBENZOYLACETONATES OF Fe(III), Co(II), Ni(II), Zn(II), Cd(II) AND Hg(II)

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PHOTOELECTRON spectroscopy is frequently used to get an insight into the electronic structure of metal complexes¹. In our laboratory complexes of Ti², Co and Ni³ have been investigated to obtain information about coordination and oxidation state of the central metal atom. A new series of bis (*p*-substituted benzoylacetonates) of Co(II), Ni(II), Zn(II) and Cd(II) has already been described in literature^{4,7}, the same series of compounds with P-bromobenzoylacetonates, along with those of Fe(III) and Hg(II), have been studied by x-ray photoelectron spectroscopy using K α radiation obtained from aluminium (1486.6 eV).

X-ray photoelectron spectra were recorded using ESCA-4 vacuum generators spectrometer. Ionising radiation was AlK α . Carbon (285.0 eV) and evaporated gold were used as references. Binding energies were reproducible to 0.10 eV. A golden grid was used as sample holder.

The *p*-bromobenzoylacetonates of Fe(III), Co(II), Ni(II), Zn(II), Cd(II) and Hg(II) were prepared according to published procedures^{4,7}.

From the table it is obvious that O1s binding energy of the ligand and water molecules attached to the metal ions as water of crystallisation is almost constant throughout the series (between 531.7 and 532.0 eV). At the same time the binding energy of 3*p* electrons of bromine which is far remote from the metal varies appreciably between 183.2 to 184.1 eV. However, in the parent ligand the binding energy of 3*p* electrons appears at 182.0 and 188.0 eV. The shift induced on complexation of the ligand to the metal has been ascribed to the hyperconjugative effect of the bromine 3*p* electrons with the π^* -orbitals of the phenyl ring.

This is the first report on the observation of hyperconjugation using x-ray photoelectron spectroscopy.

*Umroi granite is also known as Bhoilymbong granite pluton.

TABLE I

X-ray PES parameters for *p*-bromobenzoylacetates
 $(p\text{-Br-C}_6\text{H}_4\text{-CO-CHCOCH}_3)_x\text{M}$

M	O 1s(eV)	Br 3p 1/2 (eV)	Br 3p 3/2 (eV)
$(p\text{-BrC}_6\text{H}_4\text{CO-CHCOCH}_3)_x\text{M} \cdot 2\text{H}_2\text{O}$			
Fe($x = 3$)	531.8	183.3	190.0
Co($x = 2$)	531.7	183.2	190.0
Ni($x = 2$)	531.7	183.5	190.2
Cu($x = 2$)	531.8	184.1	190.7
Zn($x = 2$)	532.0	184.1	190.7
Cd($x = 2$)	532.0	183.6	190.3
Hg($x = 2$)	531.9	184.0	190.6
$(p\text{-BrC}_6\text{H}_4\text{COCH}_2\text{COCH}_3)$	529.7	182.0	188.0

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POTENTIOMETRIC STUDY OF THE KINETICS OF OXIDATION OF FORMALDEHYDE, ACETALDEHYDE, PROPIONALDEHYDE AND *n*-BUTYRALDEHYDE BY AMMONICAL SILVER NITRATE

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KINETICS of oxidation of some organic compounds like reducing sugars^{1,2} and tartaric acid³ by ammonical silver nitrate have been reported in the literature. Ammonical silver nitrate has also been used in analytical chemistry for the quantitative

determination of aldehydes⁴. A systematic kinetic study has not been carried out with aliphatic aldehydes using ammonical silver nitrate as the oxidant. In this communication we report a potentiometric study of the kinetic features of oxidation of formaldehyde, acetaldehyde, propionaldehyde and *n*-butyraldehyde by ammonical silver nitrate.

All the chemicals used were of extra pure quality. The standard solution of silver nitrate was always freshly prepared and kept in a flask coated black outside. The experiments were carried out in a double-walled cell coated black outside to avoid any photochemical reaction. The cell was fitted with an air tight rubber cork having provision for dipping the electrodes into the reaction mixture. Any loss of ammonia due to evaporation during the progress of the reaction was prevented by maintaining the vapour pressure of ammonia constant as done by Modi and Gosh¹. Water from a thermostat at the desired temperature was circulated through the outer jacket of the cell. The progress of the reaction was followed by measuring the potential of the silver electrode at various time intervals with the help of a Leeds and Northrup 7554, K-4 type potentiometer using a saturated calomel as the reference electrode. The products of oxidation were identified as the corresponding carboxylic acids by their characteristic spot tests⁵. Stoichiometric analysis revealed that two moles of silver nitrate are required for each mole of aldehyde.

Under the conditions [silver nitrate] \ll [aldehyde] the plot of E vs time (where E is the potential at the silver electrode) was linear (figure 1A) indicating the order in $[\text{Ag}^+]$ to be unity. From the slopes of such plots the pseudo first order rate constants (k') were calculated. Plot of $\log k'$ vs $\log [\text{aldehyde}]$ was linear (figure 1B) with unit slope in each case indicating the