ANGULAR DISTRIBUTION OF ELECTRONS SCATTERED INELASTICALLY BY HYDROGEN ATOMS

H. S. DESEI AND N. S. RAO
Department of Physics, Faculty of Science, M. S. University of Baroda, Baroda 390 002, India.

Yates\(^1\) approximation is a small angle and high energy approximation. The main advantage of this approximation is that it is computationally simple and higher order Born terms can be obtained in the closed form. Here there is no problem of divergent integrals. This approximation is further simplified and has been applied to various atoms for the elastic processes\(^2\)\(^-\)\(^4\). In all these problems, first two Born terms were derived according to Yates\(^1\) and the third Born term was approximated by the third Glauber elkenal series (GES) term of Yates\(^5\). At small angles very good results were obtained for elastic process by Rao and Desai\(^2\)\(^-\)\(^4\). In the present paper an attempt is made to calculate differential cross-section (DCS) for H(1S–2S) inelastic scattering.

Yates\(^1\) method for the elastic collision of electrons by the H–atom is extended to the inelastic collision of electrons by the H–atom for H(1S–2S). The results for the scattering amplitudes for this process are given as

\[
\text{Im } F^{(2)} = (A + B \frac{\partial}{\partial \lambda}) \text{Im} f^{(2)}_{\text{HEA}},
\]

\[
\text{Re } F^{(2)} = (A + B \frac{\partial}{\partial \lambda}) \text{Re} f^{(2)}_{\text{HEA}},
\]

where Im \(f^{(2)}_{\text{HEA}}\) and Re \(f^{(2)}_{\text{HEA}}\) are the imaginary and real parts of the second Born approximation for the elastic case\(^1\). These are functions of \(q, \lambda\) and \(\beta\). In the present case the numerical values of these quantities are \(\lambda = 1.5\), \(\beta = \Delta \lambda/k\), where \(\Delta \lambda\) is the average excitation energy\(^6\) and \(q = k_i - k_f\), \(k_i\) and \(k_f\) are the initial and final momenta of the scattered electron. In the equations (1) and (2) the constants \(A\) and \(B\) are given as

\[A = 0.3536, \quad B = 0.1768.\]

The third term of Yates\(^5\) for the present case is given as

\[
F^{(3)}_{\text{GES}} = (C + D \frac{\partial}{\partial \lambda}) F(\lambda, q)
\]

where \(C = -0.1187, D = -0.0559\) and \(F(\lambda, q)\) is similar to the expression given by Rao and Desai\(^3\). The first Born scattering amplitude is given as

\[
F^{(1)} = -\frac{11.3137}{(q^2 + 2.25)^2}
\]

The direct scattering amplitude is given as

\[
F_d = F^{(1)} + \text{Re } F^{(2)} + F^{3}_{\text{GES}} + i \text{Im } F^{(2)}
\]

from this equation the DCS through order \(1/k^2\) can be approximated as

\[
\frac{d\sigma}{d\Omega} = \frac{k_f}{k_i} |F_d|^2
\]

Figures 1 and 2 show the present DCS results at incident energies 100 and 200 eV respectively. The present DCS curves reproduce the curves of other results\(^7\)\(^,\)\(^8\). At 100 eV our results are higher than the other results\(^7\)\(^,\)\(^8\). The results are good at 200 eV than at 100 eV. For the checking of our results, we compared our imaginary part with the imaginary part of Byron

![Figure 1](image)

**Figure 1.** The DCS results for inelastic scattering of electrons by H–atom at incident energy 100 eV solid curve—present results, Broken Curve—results of Unnikrishnan and Prasad\(^7\), solid circles—results of Glauber\(^6\).
of third Born term\textsuperscript{1} instead of third \textit{GES}\textsuperscript{5} will improve our results over the entire angular range.

The authors are thankful to H. J. Patel incharge of M.S. University computer centre for his help in preparing the computer programme.

6 August 1982


\section*{BINUCLEAR Ni(II), Co(II), Cu(II), VO(II) and Pt(II) CHELATES OF SCHIFF BASES.}

R. P. \textsc{Mathur}, PRAVEEN \textsc{Mathur} AND R. K. \textsc{Mehta}
Department of Chemistry, University of Jodhpur, Jodhpur 342 001, India.

The binuclear metal chelates of Ni(II), Co(II), Cu(II), VO(II) and Pt(II) with \textit{o-(\textalpha-pyrindioneimino)} propanoic acid (H\textsubscript{2}PP) and \textit{o-(\textalpha-pyrindioneimino)} benzoic acid (H\textsubscript{2}PB) have not been studied so far. An attempt has been made to investigate these metal chelates and to study their magnetic behaviour. The results obtained are reported in the present communication.

All the solvents and reagents used were of AnalRegrade and used without further purification. The instruments employed were the same as reported earlier\textsuperscript{1}.

\textit{Preparation:} \textit{o-(\textalpha-pyrindioneimino)} propanoic acid (H\textsubscript{2}PP) and \textit{o-(\textalpha-pyrindioneimino)} benzoic acid (H\textsubscript{2}PB): A mixture of an ethanolic solutions of \textalpha-pyridone (0.01 mole) and \textbeta-alanine (0.01 mole) or anthranolic acid (0.01 mole), were refluxed for 1-2 hr in presence of a drop of piperidine as a condensing agent. The resulting solid mass was filtered while hot, washed with ethanol and dried in a vacuum desiccator.

\begin{figure}
\centering
\includegraphics[width=0.5\textwidth]{fig2.png}
\caption{The DCS results at incident energy 200eV. The references are same as in figure 1.}
\end{figure}

\begin{figure}
\centering
\includegraphics[width=0.5\textwidth]{fig3.png}
\caption{Comparison of present imaginary part and the imaginary part of Byron and Latour\textsuperscript{8} at incident energy 100eV.}
\end{figure}