SHORT COMMUNICATIONS

ANGULAR DISTRIBUTION OF ELECTRONS SCATTERED INELASTICALLY BY HYDROGEN ATOMS

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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 elkonal 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

$$\mathrm{Im}\ F^{(2)} = \left(A + B\frac{\partial}{\partial\lambda}\right)\ \mathrm{Im} f^{(2)}_{\mathrm{HEA}}\ , \tag{1}$$

$$\mathrm{Re}\ F^{(2)} = \left(A + B\frac{\partial}{\partial\lambda}\right)\ \mathrm{Re} f^{(2)}_{\mathrm{HEA}}\ , \tag{2}$$

where $\mathrm{Im}\, f^{(2)}_{\mathrm{HEA}}$ and $\mathrm{Re}\, f^{(2)}_{\mathrm{HEA}}$ are the imaginary and real parts of the second Born approximation for the elastic case[1]. These are functions of q, λ and β. In the present case the numerical values of these quantities are $\lambda = 1.5$, $\beta_i = \Delta E/k_i$, where ΔE 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

$$F^{(3)}_{\mathrm{GES}} = \left(C + D\frac{\partial}{\partial\lambda}\right) F(\lambda, q) \tag{3}$$

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

$$F^{(1)} = -\frac{11.3137}{(q^2+2.25)^3} \tag{4}$$

The direct scattering amplitude is given as

$$F_d = F^{(1)} + \mathrm{Re}\, F^{(2)} + F^{3}_{\mathrm{GES}} + i\, Im\, F^{(2)} \tag{5}$$

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

$$\frac{d\sigma}{d\Omega} = \frac{k_f}{k_i}\left| F_d \right|^2 \tag{6}$$

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

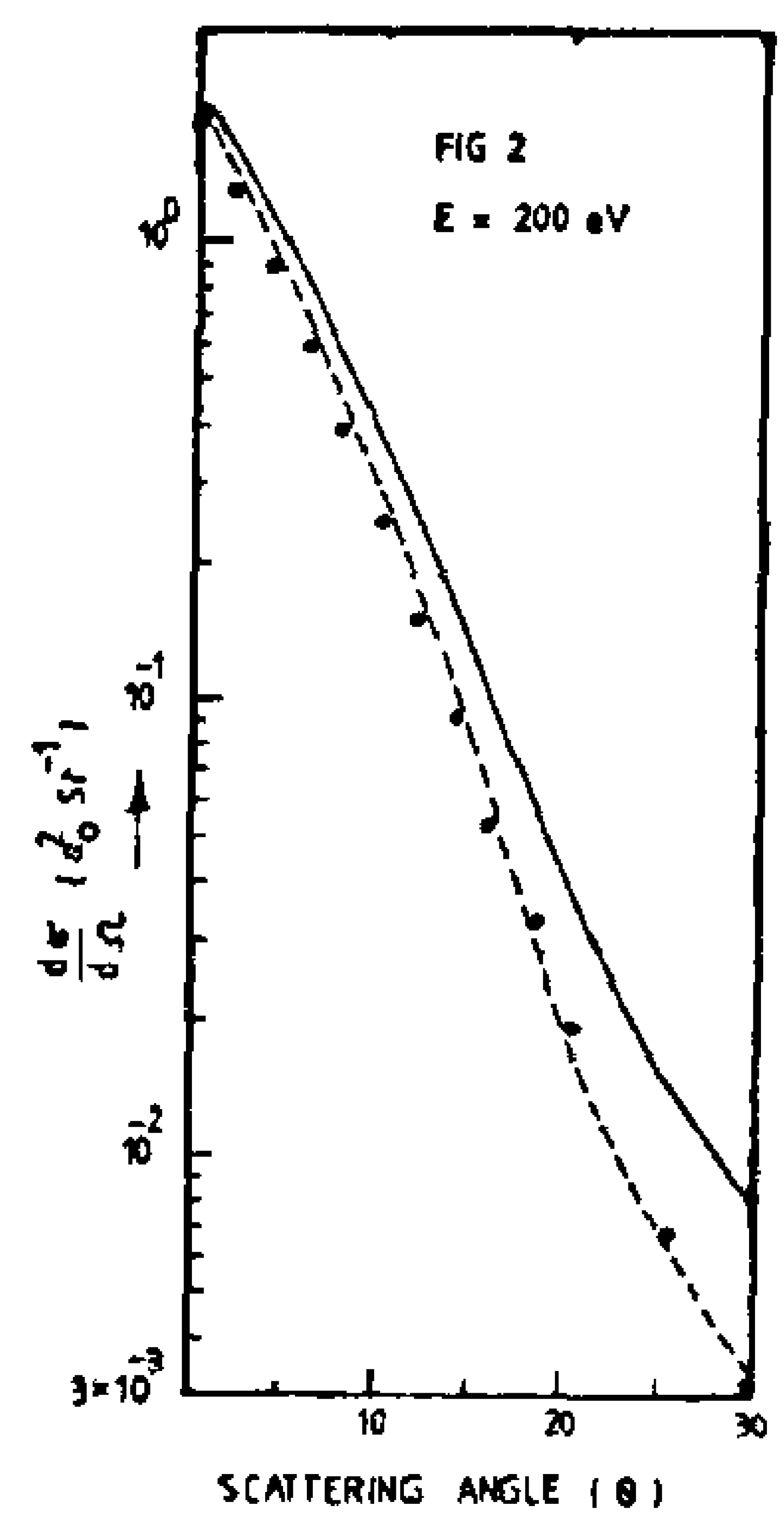

Figure 1. The DCS results for inelastic scattering of electrons by H-atom at incident energy 100 eV solid curve—present results, Broken Curve—results of Unnikrishnan and Prasad[7], solid circles—results of Glauber[8].

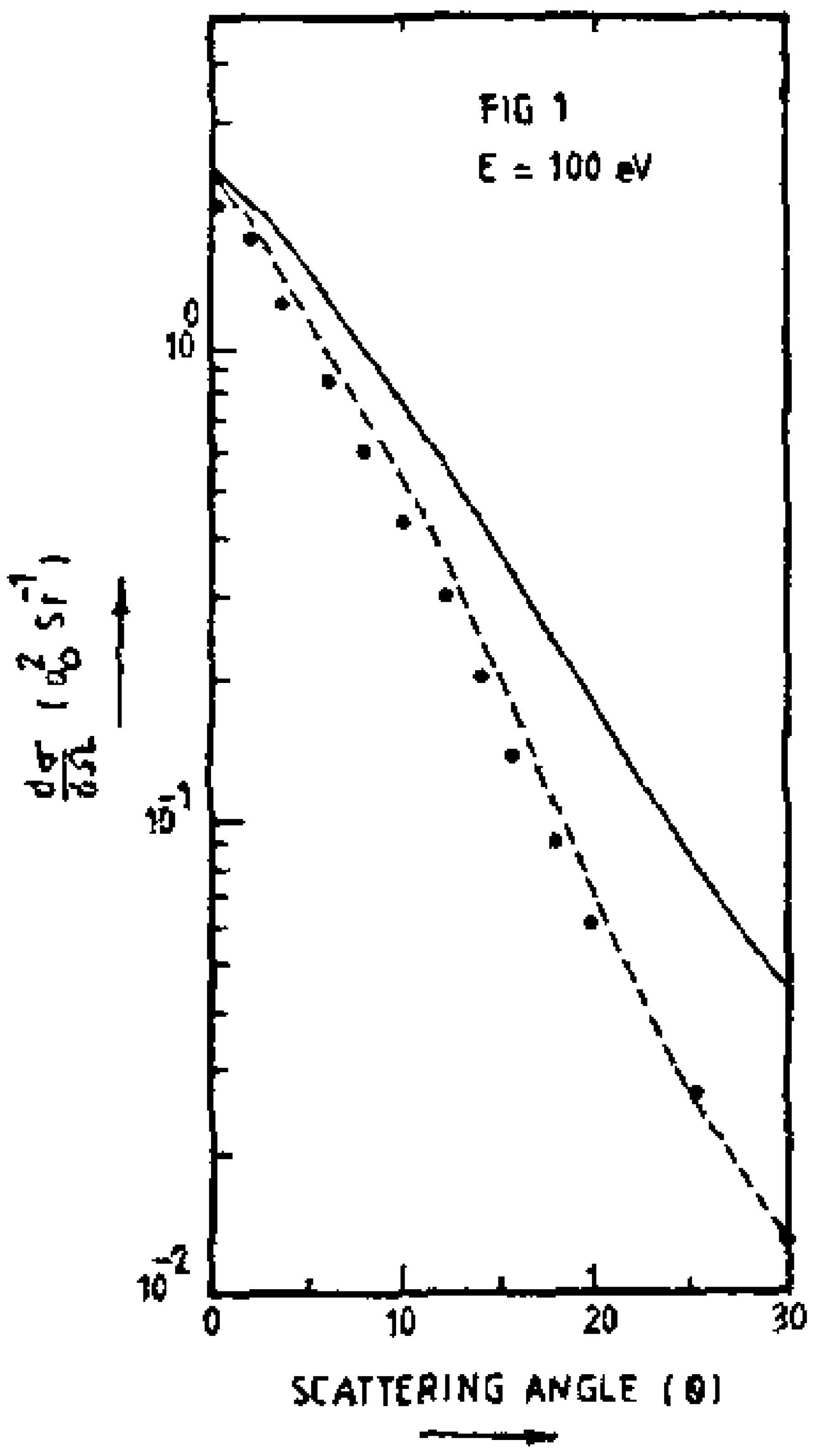

Figure 2. The DCS results at incident energy 200 eV. The references are same as in figure 1.

and Latour[6], and it is observed that there is very nice agreement at all angles. These results are displayed in figure 3.

We conclude that the present results will be improved at higher incident energies and the inclusion of third Born term[1] instead of third GES[5] will improve our results over the entire angular range.

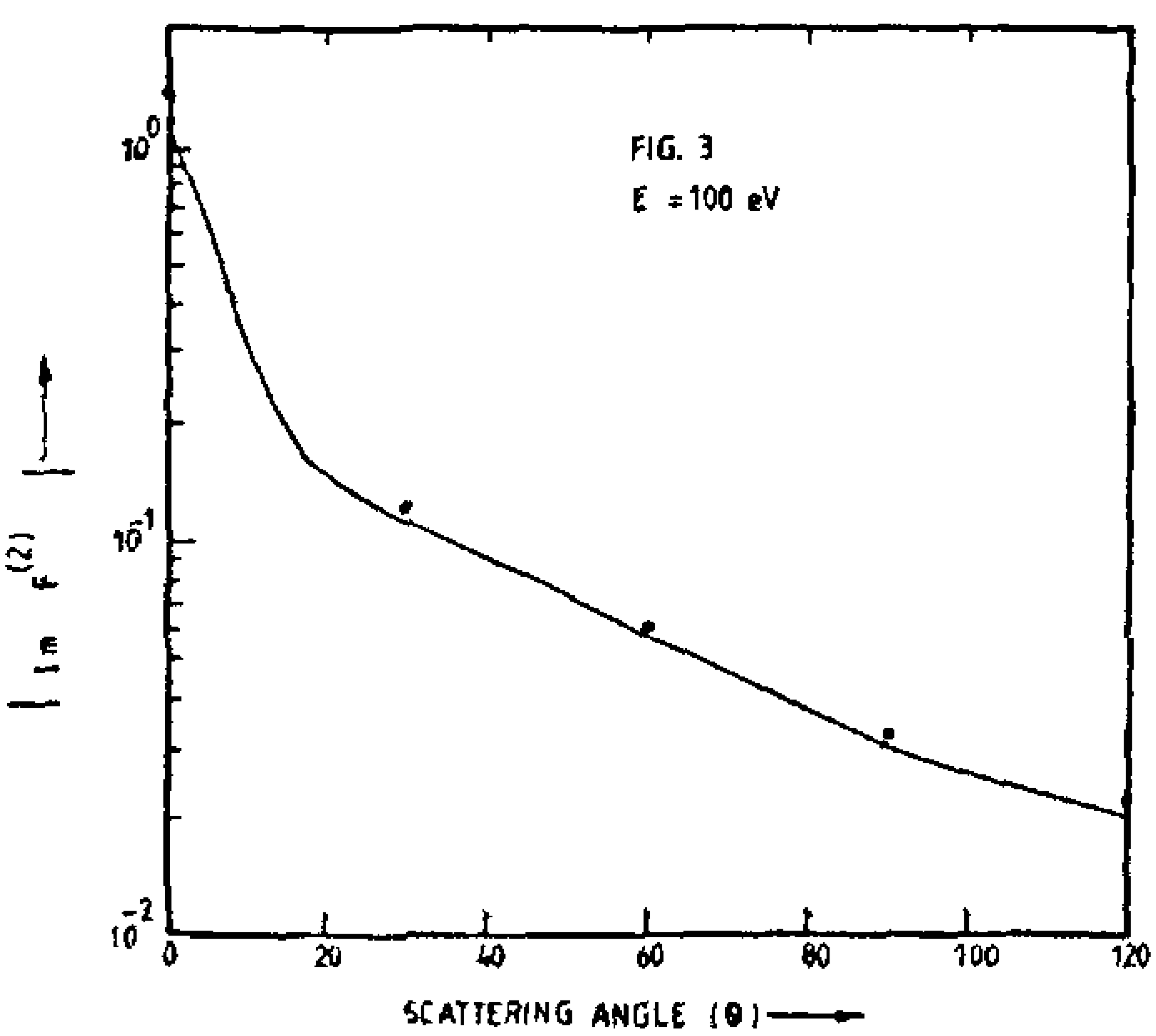

Figure 3. Comparison of present imaginary part and the imaginary part of Byron and Latour[6] at incident energy 100 eV.

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

1. Yates, A. C. *Phys. Rev.*, 1979, **A19**, 1550.
2. Rao, N. S. and Desai H. S. *Pramana.*, 1981, **17**, 309.
3. Rao, N. S. and Desai H. S., *J. Phys.*, 1983, **16**, 863.
4. Rao, N. S. and Desai H. S., *J. Pure Applied Phys.*, (in press).
5. Yates, A. C., *Chem. Phys. Lett.*, 1974, **25**, 480.
6. Byron, F. W. Jr. and Latour L. J. Jr, *Phys. Rev.*, 1976, **A13**, 649.
7. Unnikrishnan K and Prasad M. A., *J. Phys.*, 1982, **B15**, 1549.
8. Glauber, R. J., *Lectures in theoretical Physics.*, Vol. I (ed) W. E. Brittin and L. G. Duncan New York, Inter Science, 1959, 315.

BINUCLEAR Ni(II), Co(II), Cu(II), VO(II) and Pt(II) CHELATES OF SCHIFF BASES.

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THE binuclear metal chelates of Ni(II), Co(II), Cu(II), VO(II) and Pt(II) with *o*-(-α-pyridoneimino) propanoic acid (H_2PP) and *o*-(-α-pyridoneimino) benzoic acid (H_2PB) 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 AnalaR grade and used without further purification. The instruments employed were the same as reported earlier[1].

Preparation: *o*-(-α-pyridoneimino) propanoic acid (H_2PP) and *o*-(-α-pyridoneimino) benzoic acid (H_2PB): A mixture of an ethanolic solutions of α-pyridone (0.01 mole) and β-alanine (0.01 mole) or anthranilic acid (0.01 mole), were refluxed for 1-2 hr in presence of a drop of piperdine as a condensing agent. The resulting solid mass was filtered while hot, washed with ethanol and dried in a vacuum desiccator