overnight. was filtered and recrystallized from methanol, m.p. 118-120°C, yield 50%. Found N, 15.92; C₃₀H₂₇N₂O₂S requires N, 16.18%. IR: 3480 (O-H), 3240 (N-H), 2970 & 2875 (CH), 1725 (C=O), 1625 (C=N), 1180 (C=S).

1-Substituted aminomethyl-3-cyclohexylthiosemicarbazono-2-indolinones (IV):

Method A

An appropriate 3-cyclohexylthiosemicarbazono-2-indolinone (I, 0.005 mol) was suspended in 10 ml of warm ethanol. To this suspension was added 1 ml of 37% formalin and an appropriate secondary amine (0.005 mol) with vigorous stirring. This mixture was then heated on a water bath for 10 min and allowed to remain at room temperature overnight. The separated solid product was filtered, washed with petroleum ether (b.p. 60-80°C) and finally recrystallized from ethylacetate/chloroform-petroleum ether (b.p. 60-80°C). All compounds (IV) thus synthesized are listed in table 1, yield 55-70%. Their IR spectra showed characteristic absorption bands at 3300-3225 (NH), 2900-2870 and 2825-2800 (CH), 1685-1670 (C=O), 1615-1600 (C=N), 1185-1150 (C=S). PMR (CDCl₃) of IV: 1.13-2.30 (m, 11H, CH₂, CH), 2.38 (s, 3H, CH₃), 2.47-2.74 (m, 4H, CH₂-N-CH₂), 3.54-3.84 (m, 4H, CH₂-O-CH₂), 4.45 (s, 2H, N-CH₂-N), 7.05 (q, J=9 & 1.5 Hz, 1H, H₆), 7.40 (d, J=1Hz, 1H, Ha), 7.64 (d, J=6.5 Hz, 1H, Hc); PMR (CDCl₃) of IV: 1.17-2.07 (m, 11H, CH₂, CH₂), 2.14 (s, 3H, Ar-CH₃), 2.25 (s, 3H, N-CH₃), 2.26-2.65 (m, 8H, CH₂-N-CH₂), 4.36 (s, 2H, N-CH₂-N), 6.88 (q, J=9 & 1.5 Hz, 1H, Hb), 7.30 (d, J=1 Hz, 1H, Ha), 7.55 (d, J=4.5 Hz, 1H, H₂), PMR (CDCl₃) of IV: 1.02-2.30 (m, 17H, CH, CH₂), 2.37-2.74 (m, 4H, CH₂-N-CH₂), 4.43 (s, 2H, N-CH₂-N), 6.97 (d, J=7.5 Hz, 1H, Hc), 7.31 (q, J=9 & 1.5 Hz, 1H, Hb), 7.52 (d, J=2 Hz, 1H, Ha).

Method B

1-Morpholinomethyl-3-cyclohexylthiosemicarbazono-2-indolinone (IV), prepared according to the method A, was also prepared by heating a mixture of 1-hydroxymethyl-3-cyclohexylthiosemicarbazono-2-indolinone (III, 0.005 mol) and morpholine (0.005 mol) in 10 ml ethanol, on a water bath for 10 min. The mixture was stirred vigorously and allowed to stand overnight. The separated solid was filtered, washed with petroleum ether (b.p. 60-80°C) and recrystallized from ethylacetate. This compound was identical with the compound IVa synthesized by method A. PMR (CDCl₃) spectrum of this compound exhibited signals at 1.10-2.24 (m, 11H, CH₂, CH), 2.36-2.67 (m, 4H, CH₂-N-CH₂), 3.38-3.74 (m, 4H, CH₂-O-CH₂), 4.36 (s, 2H, N-CH₂-N), 6.94-7.68 (m, 4H, Ar-H).

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KINETICS OF POLYMERIZATION OF ACRYLAMIDE INITIATED BY Mn²⁺-L-THRONEINE REDOX SYSTEM

T. BALAKRISHNAN, S. SUBBU* and T. K. SHABEER*

Department of Physical Chemistry, University of Madras, Madras 600 025, India.
*Department of Chemistry, Pachaiyappa's College, Madras 600 030, India.

Manganese (III) salts in combination with a variety of reducing agents such as diglycolic acid¹, isobutyric
acid\textsuperscript{2}, ascorbic acid\textsuperscript{3}, thioglycolic acid\textsuperscript{4}, ethoxyacetic acid\textsuperscript{5}, etc. have been used for polymerization of vinyl monomers. In this paper, we report the kinetics of polymerization of acrylamide (AAM) initiated by Mn\textsuperscript{3+}-L-Threonine (L-TRN) redox system.

Acrylamide was purified by recrystallization from chloroform. Manganese (III) acetate dihydrate was prepared by a known method\textsuperscript{6}. Sodium bisulphate, L-Threonine and all other chemicals used were of analar grade. Polymerization was carried out in nitrogen atmosphere in polymerization tubes. All the experiments were conducted in aqueous sulphuric acid medium. \( R_p \) was followed by bromometry and \(-R_m\) by iodometry.

Polymerization of AAM initiated by Mn\textsuperscript{3+}-L-TRN system takes place at measurable rates at 40\textdegree C. The steady state is attained in 5 min. The rate of polymerization increases [(2.94–20.27) \times 10\textsuperscript{-5} m.1\textsuperscript{-1}.s\textsuperscript{-1}] with increasing [AAM] (0.1028–0.7199 M). The plot of log \( R_p \) vs log [AAM] is a straight line with unit slope (figure 1A) and the plot of \( R_m \) vs [AAM] is a straight line (figure 1B) showing that the order with respect to [AAM] is one. \( R_p \) is found to be independent of [Mn\textsuperscript{3+}], [L-TRN], [H\textsuperscript{+}] and ionic strength.

Rate of Mn\textsuperscript{3+}-ion disappearance (\(-R_m\)) increases [(0.9–3.1) \times 10\textsuperscript{-6} m.1\textsuperscript{-1}.s\textsuperscript{-1}] with increasing [Mn\textsuperscript{3+}] [(0.909–5.909) \times 10\textsuperscript{-3} M]. The plot of \(-R_m\) vs [Mn\textsuperscript{3+}] is a straight line with zero intercept (figure 2A) showing the first order dependence of \(-R_m\) on [Mn\textsuperscript{3+}]. \(-R_m\) also increases linearly with the increase of [L-TRN]. The plot of \((-R_m)\textsuperscript{-1} vs [L-TRN]\textsuperscript{-1}\) is a straight line with an intercept on the \((-R_m)\textsuperscript{-1} axis (figure 2B). This indicates the formation of a weak complex between Mn\textsuperscript{3+} and L-TRN. Similar observations have been made by Santappa et al\textsuperscript{2}. \(-R_m\) is found to be independent of [AAM], [H\textsuperscript{+}] and ionic strength. \( R_p \) is decreased slightly by the addition of watermiscible organic solvents such as acetone and ethanol. \(-R_m\) is not affected by the addition of such solvents.

To explain these experimental observations the following kinetic scheme is proposed:

\[
\text{Mn}^{3+} + \text{L-TRN} \xrightarrow{K_{\text{fast}}} \text{complex} \\
\xrightarrow{k_d} \text{R}^* + \text{Mn}^{2+} + \text{H}^+ \\
\xrightarrow{k_0} \text{products} \\
\xrightarrow{k_i} \text{M}^* \\
\xrightarrow{k_p} \text{M}_i
\]

Figure 1. Variation of \( R_p \) with [AAM].

Figure 2. Variation of \(-R_m\) with [Mn\textsuperscript{3+}] and [L-TRN].
\[ M'_{t-1} + M \xrightarrow{k_p} M'_t \]
\[ M'_t + \text{complex} \xrightarrow{k_r} \text{polymer} + \text{Mn}^{2+} + Z \]

where \( Z \) may be L-TRN itself or an inactive product obtained from L-TRN (\( M = \text{AAM} \)). Using the steady-state assumption, the following expressions are derived

\[ R_p = \frac{k_p \cdot k_d \cdot [\text{AAM}]^2}{k_i ([\text{AAM}] + (k_o/k_i) [\text{Mn}^{3+}])} \]  
(1)

The value of the term \((k_o/k_i) [\text{Mn}^{3+}]\) is negligibly small (0.0177) when compared to the value of [AAM]. Hence neglecting \((k_o/k_i) [\text{Mn}^{3+}]\) in (1), the following equation is obtained

\[ R_p = \frac{k_p \cdot k_d \cdot [\text{AAM}]}{k_i} \]  
(2)

\[-R_m \] is given by the expression

\[-R_m = \frac{2Kk_d [\text{Mn}^{3+}]_{\text{total}} \cdot [\text{L-TRN}]}{1 + K [\text{L-TRN}]} \]  
(3)

where \([\text{Mn}^{3+}]_{\text{total}} = [\text{Mn}^{3+}] + K [\text{Mn}^{3+}] [\text{L-TRN}]\).

The expressions (2) and (3) agree with our observations. Various kinetic and thermodynamic parameters have been evaluated and presented:

<table>
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<th>( \Delta E^{\ast})</th>
<th>( \Delta S^{\ast})</th>
<th>( \Delta G^{\ast})</th>
<th>( k_p/k_i )</th>
<th>( k_o/k_i )</th>
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<td>3.32</td>
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<td>24.39</td>
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A NEW ISOLATE OF PLASMODIUM FALCIPARUM AND ITS CHLOROQUINE SENSITIVITY

D. C. KAUSHAL
Division of Microbiology, Central Drug Research Institute, Lucknow 226 001, India.

Malaria caused by the protozoan parasites of genus _Plasmodium_ has been identified as a major public health problem in many developing countries including India\(^1\). Falciparum malaria due to _P. falciparum_ is the most fatal form of the disease and also involves cerebral, renal and pulmonary complications. Although the overall incidence of malaria, after an upsurge in 1970's, has shown a decreasing trend in recent years (2 million cases in 1984), the incidence of _P. falciparum_ has proved less responsive and constitutes a higher proportion of the total malaria cases (30% in 1984 as compared to 10% in 1977)\(^2\).

The chloroquine-resistant strain of _P. falciparum_ has emerged as the major setback to chemotherapy necessitating major international efforts. But the mechanism of antimalarial drug action as well as biochemical and genetic mechanisms of resistance are not known\(^3\). Studies on different geographical isolates of _P. falciparum_ and their drug sensitivity are essential to understand the mechanism and spread of drug resistance as well as to evolve suitable chemotherapeutic measures. Studies on different isolates of _P. falciparum_ outside India have shown the existence of genetic diversity as judged by isoenzyme and antigenic pattern as well as the sensitivity to anti-malarial drugs\(^4\). To initiate such studies on Indian isolates of _P. falciparum_, the adaptation of isolates from different regions of India, to _in vitro_ culture, is a pre-requisite. Three Indian isolates of _P. falciparum_ (FAN-5 from Rajasthan\(^5\), MRC from Harayana\(^5\) and FCK-2 from Karnataka\(^5\)) have been adapted to _in vitro_ culture and used for serological and seroepidemiological studies.

In the present study we have established an isolate (DCK-l) of _P. falciparum_ (from Lucknow, UP) in _in