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Thermal decomposition and structural features of S120 *J*-aggregates

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1-methyl-1'-octadecyl-2,2'-cyanine iodide (S120) molecules in the dimethylformamide-water matrix, unlike pseudoisocyanine one, form ring-type aggregates having the radius defined by the monomer size. This structure is energetically favorable due to the amphiphilic nature of the S120 molecule. In the ring-type chain of S120 molecules, their $C_{18}H_{37}$ radicals are in contact with one another, thus diminishing their interaction with water. The ring-type structure of *J*-aggregates causes a sharp maximum in their size distribution manifested clearly in absorption spectra. The thermal decomposition degree and structure parameters of *J*-aggregates have been derived from temperature-dependent absorption spectra.

В матрице диметилформамид-вода молекулы 1-метил-1'-октадецил-2,2'-цианинйодида (S120), в противоположность молекулам псевдоизоцианина, образуют кольцеобразные *J*-агрегаты с радиусом кольца, определяющимся размерами мономера. Такая структура является энергетически более выгодной, благодаря амфифильным свойствам молекулы S120. Кольцеобразная структура *J*-агрегатов приводит к узкому максимуму распределения их по размерам, что отчетливо проявляется в спектрах поглощения. Из температурных зависимостей спектров поглощения определена степень термического разложения и структурные параметры *J*-агрегатов.

Impurity molecular chains in organic matrices (*J*-aggregates) discovered by E.Jelley (1937) [1] and G.Scheibe (1937) [2], attracted since the later seventies attention of researchers due to similarity of electronic relaxation processes therein to those in biological and light-harvesting systems [3, 4]. A peculiar connection between the structure and optical properties of *J*-aggregates permits them to be used as high-sensitivity probes for biological membrane potentials [5]. Due to a strong nonlinearity of optical response [6], *J*-aggregates show good prospects for creating new light-sensitive materials with a high optical nonlinearity and for applications in optical communication systems [7].

In a pure physical aspect, *J*-aggregates are of interest as one-dimensional model systems to explore some complicated problems: effects of exciton state coherency [8–14] and superradiation [15–18], influence of diagonal and off-diagonal disorder on excitonic states [10–14, 19, 20]. A recent research [21, 22] has discovered essential distinctions of self-trapping processes in a molecular chain incorporated into a matrix from those in three-dimensional or strictly one-dimensional systems.

The features of *J*-aggregates under investigation are due to the structure of individual S120 molecule. It contains the same fluorophore group as the well-known PIC molecule but is different in that its hydro-