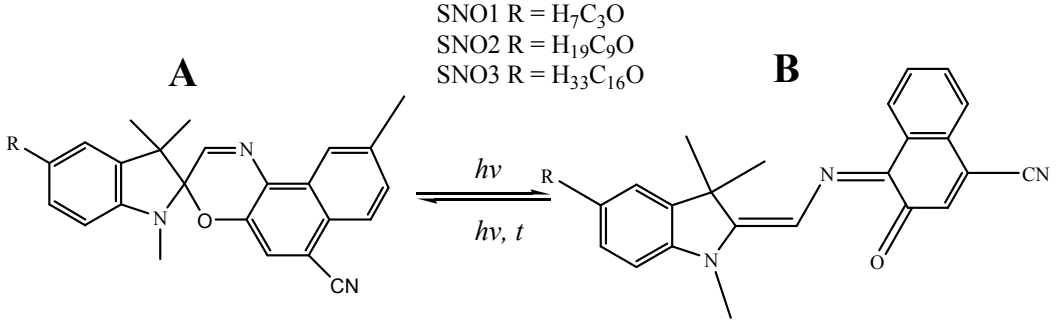
Photochromism of Spironaphthoxazines in Frozen Matrices

Evgeni Glebov,[a,b] Valeri Korolev,[a] Elena Pritchina,[a,b] Victor Plyusnin,[a,b]
Marina Nikolaeva,[c] and Anatoly Metelitsa[d]

[a] Voevodsky Institute of Chemical Kinetics and Combustion, Novosibirsk 630090 Russia
(glebov@kinetics.nsc.ru)
[b] Novosibirsk State University, Novosibirsk 630090 Russia
[c] Boreskov Institute of Catalysis, Novosibirsk 630090 Russia
[d] Research Institute of Physical and Organic Chemistry, Southern Federal University, Rostov-on-Don 344104 Russia

Spironaphthoxazines (SNO, Scheme 1) represent one of the most important classes of organic photochromic compounds. They demonstrate high molar absorptivity of coloured form and high fatigue resistance. Photochromic properties of spirooxazines are determined by the mutual transitions of a closed colorless spiro-form A and an open colored merocyanine form B (Scheme 1). In this work, photochromism of SNO in frozen matrices (77 K) was studied by means of stationary photolysis, ESR and quantum chemistry. Stabilization of high-reactive intermediates at low temperature opens a possibility in direct studying of the reaction mechanisms.

The quantum yield of A ⇆ B transition in ethanol matrix at 77 K was found to be high enough (0.01 – 0.02). For one of the SNO, the formation of a merocyanine radical was observed. The radicals were formed by an H atom transition from the solvent molecule to the light-excited B-form. The structure of radicals was confirmed by quantum chemical calculations. The formation of radicals represents a new channel of SNO photodegradation.



Scheme 1. Closed and open forms of SNO.