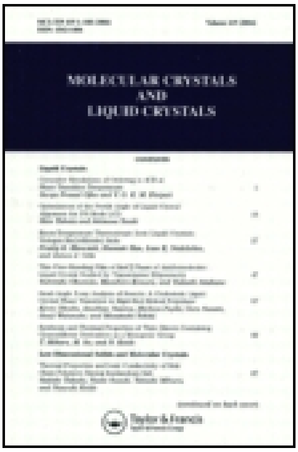


Molecular Crystals and Liquid Crystals Incorporating Nonlinear Optics
Publication details, including instructions for authors and subscription information:
http://www.tandfonline.com/loi/gmcl17

“Pseudo-Protonic Acid Doping” of Polyaniline

M. Angelopoulos [a] [b] , S. P. Ermer [a] , S. K. Manohar [a] , A. G. Macdiarmid [a] & A. J. Epstein [c]

[a] Department of Chemistry, University of Pennsylvania, Philadelphia, PA, 19104-6323, USA

[b] Department of Physics and Department of Chemistry, The Ohio State University, Columbus, Ohio, 43210-1106, USA

[c] Thomas Watson Research Center, IBM Corporation, Yorktown Heights, NY, 10598, USA

Version of record first published: 28 Mar 2007.

To cite this article: M. Angelopoulos , S. P. Ermer , S. K. Manohar , A. G. Macdiarmid & A. J. Epstein (1988): “Pseudo-Protonic Acid Doping” of Polyaniline, Molecular Crystals and Liquid Crystals Incorporating Nonlinear Optics, 160:1, 223-223

To link to this article: http://dx.doi.org/10.1080/15421408808083016

Mol. Cryst. Liq. Cryst., 1988, Vol. 160, p. 223
Reprints available directly from the publisher
Photocopying permitted by license only

Printed in the United States of America

"Pseudo-Protonic Acid Doping" of Polyaniline[†]

M. ANGELOPOULOS,[‡] S. P. ERMER, S. K. MANOHAR and A. G. MACDIARMID

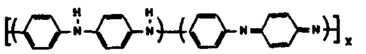
Department of Chemistry, University of Pennsylvania, Philadelphia, PA 19104-6323, USA

and

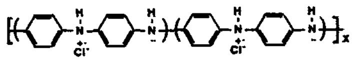
A. J. EPSTEIN

Department of Physics and Department of Chemistry, The Ohio State University, Columbus, Ohio 43210-1106, USA

The emeraldine oxidation state of polyaniline, in its base form

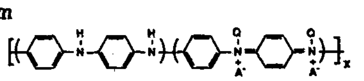


may be doped to the metallic conducting regime by aqueous HCl in a novel protonation reaction to form the corresponding emeraldine hydrochloride salt which exists as the paramagnetic semiquinone radical cation:



We now find that a large new class of N-substituted derivatives of emeraldine may be synthesized by a "pseudo-protonic acid" doping process involving the reaction of emeraldine base with reagents such as Me_2SO_4, Et_2SO_4, $C_6H_5CH_2Br$, $H_2C{=}CHCH_2Br$, Me_3SiCl, $C_6H_5C(O)Cl$, $C_6H_5SO_2Cl$, $MeC_6H_4SO_2Cl$, $ClO_2S(C_6H_4)SO_2Cl$ and o-$NO_2(C_6H_4)SCl$ etc. to yield products which from preliminary studies are believed to have the above semiquinone radical cation structure, i.e. polaronic structure, where Q = Me, Et, $C_6H_5CH_2$, $H_2C{=}CHCH_2$, Me_3Si, $C_6H_5C(O)$, $C_6H_5SO_2$, $Me(C_6H_4)SO_2$, $O_2S(C_6H_4)SO_2$, o-$NO_2(C_6H_4)S$ etc. and A = Cl, Br, $MeSO_4$ and $EtSO_4$.

In certain cases involving a variation in experimental conditions it seems possible that the bipolaronic form



of the polymer might be produced. Many of these polymers show significant solubility in several organic solvents and may be prepared as films and/or powders exhibiting conductivities up to ~50 S/cm. This work was supported by NSF Grant No. DMR-85-19059 (M. A.), NASA Grant No. NAG10-0025 (S. K. M.) and a grant from Lockheed Corp. (S. P. E.).

[†] Manuscript being prepared for submission to Journal of the American Chemical Society.

[‡] Present Address: Thomas Watson Research Center, IBM Corporation, Yorktown Heights, NY 10598, USA.