

Chiral Water – Circular Dichroism of Perturbed Pure Water

Vittorio Elia¹, Tamar A. Yinnon², Rosario Oliva¹, Elena Napoli¹, Roberto Germano³,
Fabrizio Bobba⁴ & Angela Amoresano¹.

¹Department of Chemical Sciences, University “Federico II” Complesso Universitario di Monte S. Angelo, Via
Cintia, I-80126 Naples, Italy

²K. Kalia, D.N. Kikar Jordan 90666, Israel

³PROMETE Srl, CNR Spin off, via Buongiovanni, 49 I-80046 San Giorgio a Cremano (Naples), Italy

⁴Physics Department “E. R. Caianiello”, University of Salerno, 84084 Fisciano (SA), Italy

Pervasiveness of chirality in biosystems raises questions on its role in life's origin. Recent experiments revealed chiral ordering of achiral molecules in single-component isotropic liquids. The phenomena evoked the possibility of such ordering in water. We present its first experimental evidence -- perturbing pure water by immersing in it a hydrophilic membrane, manual agitating the liquid, removal and drying of the membrane, repetition of these steps, trigger such ordering. Circular dichroism spectral features of the liquid remaining after removal of the membrane resemble those ones of β -sheet ordered biomolecules. On heating the perturbed water above 90°C, these features disappear. On lyophilizing the perturbed water, a solid residue composed of up to tens of microns sized chiral superstructures remains. Aforementioned phenomena are not caused by impurities (molecules released by the membrane or biomolecules). We expect our findings to contribute to understanding mirror-symmetry breaking in water and its role in prebiotic systems.

Vittorio Elia

già Prof. Associato di Chimica Fisica Dipartimento di Scienze Chimiche

Università "Federico II" Napoli

Via Cintia 32 80126

Tel. +393490843931