

## **GREEN CHEMISTRY ACTIVITIES OF KOSTAS DEMADIS' RESEARCH GROUP AT THE DEPARTMENT OF CHEMISTRY, UNIVERSITY OF CRETE**

**Group Web Page:** <http://www.chemistry.uoc.gr/en/personnel/faculty/demadis.htm>

**RESEARCH.** Precipitation and deposition of sparingly soluble salts such as  $\text{CaCO}_3$ ,  $\text{BaSO}_4$ ,  $\text{Mg(OH)}_2$ ,  $\text{SiO}_2$ ,  $\text{MgSiO}_3$  etc. on metal surfaces, such as piping and heat exchangers, constitutes a major problem in industrial cooling waters. These create problems related to the system's efficient thermomechanical operation. A variety of solutions are offered by the use of additives that act as growth inhibitors of these insoluble metal salts. Lately, there has been pressure by environmental organizations as well as governmental agencies for use of biodegradable additives that will replace polyphosphonates and polyacrylate polymers and their derivatives. These additives can be either small molecules or polymers, which have to conform to the following conditions: they have to be non-toxic, they should not bioaccumulate and they have to be biodegradable. As a representative example, the case of carboxymethylinulin is mentioned that is used as a scale growth inhibitor for  $\text{CaCO}_3$ ,  $\text{CaSO}_4$ ,  $\text{BaSO}_4$ ,  $\text{SrSO}_4$ , etc.

**PUBLICATIONS.** The following articles and conference papers on Green Chemistry have been produced from our group:

1. Inorganic Foulants in Membrane Systems: Chemical Control Strategies and the Contribution of "Green Chemistry". Demadis, K.D.; Neofotistou, E.; Mavredaki, E.; Tsiknakis, M.; Sarigiannidou, E.-M.; Katarachia, S.D. *Desalination* 2005, 179, 281. (<http://www.desline.com/articoli/6303.pdf>)
2. Biodegradable Additives in Chemical Cooling Water Treatment: The Contribution of "Green Chemistry". Neofotistou, E.; Mavredaki, E.; Sarigiannidou, E.; Demadis, K.D. *Hydroeconomy* 2004, March-April, p. 106 (in Greek).
3. Environmentally friendly chemical additives: applications for  $\text{SiO}_2$  dissolution in water systems. Demadis, K.D.; Mavredaki, E. *Hydroeconomy* 2005, February-March, p. 32 (in Greek).
4. Novel, Multifunctional, Environmentally Friendly Additives for Effective Control of Inorganic Foulants in Industrial Water and Process Applications. Demadis, K.D.; Stathouloupoulou, A. *Materials Performance* 2005, submitted.
5. Dissolution Enhancement of Colloidal Silica By Environmentally Benign Additives. Potential Applications in Silica-Laden Water Systems. Demadis, K.D.; Mavredaki, E. *Environmental Chemistry Letters* 2006, in press.
6. Use of Biodegradable Additives in the Inhibition of Amorphous Silica ( $\text{SiO}_2$ ) and Magnesium Silicate and in their Dissolution. 1st Greek Symposium on Green Chemistry and Sustainable Growth, EXPO-Athens, Athens, Greece, 27-28 February, 2004.
7. Biodegradable Additives in Chemical Cooling Water Treatment: The contribution of "Green Chemistry". 1st Greek Symposium on Green Chemistry and Sustainable Growth, Athens-EXPO, Athens, Greece, 27-28 February, 2004.
8. Biodegradable Additives as Control Agents for Colloidal  $\text{SiO}_2$  Growth and Their Possible Utility in Industrial Water Systems. 8th Greece-Cyprus Chemistry Conference, Thessaloniki, Greece, December 10 – 13, 2004.

9. Inorganic Foulants in Membrane Systems: Chemical Control Strategies and the Contribution of “Green Chemistry”. Membranes in Drinking and Industrial Water Production, L’ Aquila, Italy, November 15-17, 2004.
10. Use of Environmentally Benign Chemical Additives in Water Treatment Technologies: The Contribution of Green Chemical Technology. 9th International Conference of Environmental Science and Technology, September 1st – 3rd 2005, Rhodes Island, Greece.
11. Solving Water Treatment’s “Gordian Knots” the “Green Way”. EUROCORR 2005- The European Corrosion Congress, Lisbon, Portugal, September 4-8, 2005.
12. The Role of “Green” Additives in Precipitation Control and Potential Applications in Industrial Water Systems. 20th National Greek Chemistry Conference, Ioannina, Greece, September 20 – 24, 2005.
13. Use of Biodegradable Chemical Compounds as Control Additives for Colloidal SiO<sub>2</sub> and Their Possible Application in Industrial Water Systems, 2nd Macedonian Environmental Conference, Thessaloniki, Greece, October 8-12, 2005.
14. Industrial Water Systems: Problems, Challenges and Solutions. AQUA2005: Aquaculture of South East European Countries, Athens, Greece, October, 21-23, 2005 (Invited Lecture).