Synthesis of nano-structured copolymeric hydrogels based on *N*-Isopropyl acrylamide (NIPA) by Microemulsion Polymerization

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A new nano-sized material has been developed by the copolymerization of *N*-isopropyl acrylamide (NIPA) with modified monomers. One of the most remarkable methods to obtain nanoparticles is the microemulsion polymerization [1]. This feature has not been exploited at all due to the microemulsion polymerization can be also applied to obtain nanohydrogels [2]. Depending on its design, water/oil/surfactant systems present one, two or three phases when they are in equilibrium; one of which contains the quasi-totality amount of the surfactant [3]. The development of Hydrophilic-Liphophilic Balance systems (HLB) has simplified and systematized the selection of an optimal surfactant for specific applications in emulsions and microemulsions [4]. Undoubtedly, the complexity of the nano-science implies the use of new chemical structuration and functionalization techniques that exploit the properties of nanoparticles that let them express in selective manner specific qualities [5]. In this regard, the polymer science is the nearest to allow selective chemical structure due to the polymers are complex materials that have a wide variety of properties that can be changed before, during and after their issuance [6]. Hydrogels based on NIPA show temperature sensitivity due to the Lower Critical Solution Temperature of the NIPA that is located near of 32°C. The importance of the obtantion of nanometric hydrogels is related to administration of medicines; particularly to combat cancer and other industrial diseases. It is also another diverse applications such as tissues, cosmetics, paints, construction, packaged foods, etc. [7]. The nano-sized materials were characterized by DSC, FTIR, QLS and SEM.

References:

[1] Antonietti M., Lohmann S. and Van Niel C., **Macromulecules**, Vol. 25, (1992), 1139-1143.
[2] Katime I., Katime O. and Katime D. **"Los materiales inteligentes de este Milenio: los hidrogeles polímeros"**. Servicio Editorial de la Universidad del País Vasco. Bilbao 2004
[3] A. Chiach, and A. Poniewierski, **Journal of Chemistry and Physics**, Vol. 11, (1994), 8315-8320.
[4] Bancroft W.O., **J. Phys. Chem**., **17**, 514 (1913).
[5] Anderson B. C. and Mallapragada S. K., **Biomaterials**, Vol. 23, (2002), 4345-4352.
[6] Funke W., Okay O. and Joos-Müller B., **Advanced Polymer Science**, Vol. 136 (1998), 139.
[7] Maitra A. N., Mitra S. and Sahni M. **Indian Patent Application.** (1999) 1000/cal/99

Figures:

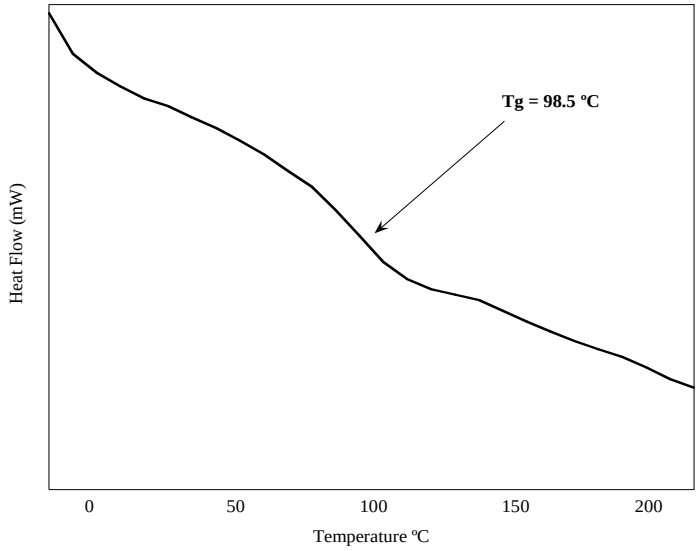

Figure 1. DSC calorimetric curve of NIPA based hydrogels.

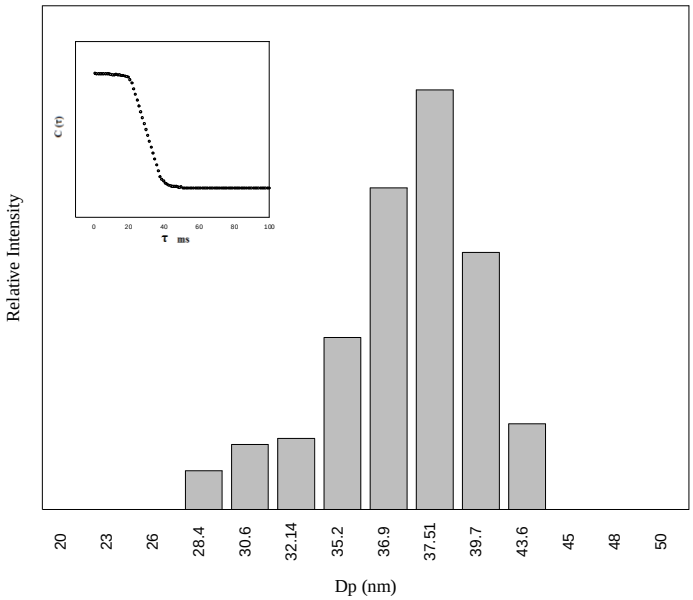

Figure 2. Particle size distribution of the NIPA based hydrogels measure by QLS.

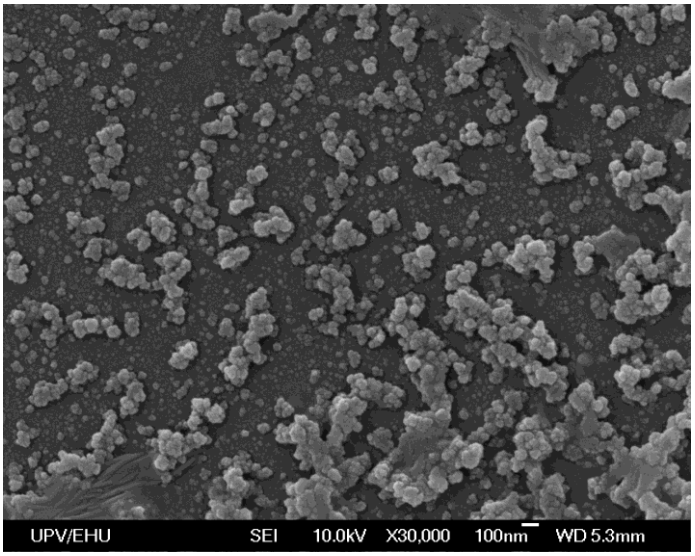

Figure 3. SEM micrography of the NIPA based hydrogels.