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MATERIAL DESIGN FOR FUNCTIONAL BIONANOPARTICLES

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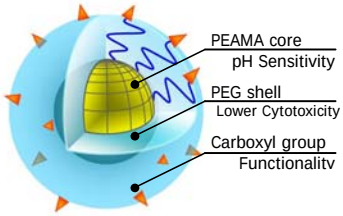

Figure 1. Schematic picture of the functionalized nanogel.

Studies on nanomaterials are receiving great interest and are widely extending into diverse fields of science and technology. Recently, we are focusing on preparation of pH-responsive core-shell type nanogel shown in Scheme 1, which consists of pH-responsive polyamine cross-linking core along with PEG tethered chains shell[1]. The size of the obtained nanogels was controllable in the range between 50 and 680 nm. The pH-sensitive swelling/deswelling behavior of the nanogels was studied by dynamic light scattering to confirm their volume phase transition at a pH around 7.0. The DOX loaded, pH-sensitive PEGylated nanogel showed almost no initial burst release of the DOX under physiological pH, whereas significant release of DOX from the pH-sensitive PEGylated nanogel was observed at the endosomal pH. The antitumor activity of the DOX-loaded, pH-sensitive, PEGylated nanogel against the human breast cancer cell line MCF-7 was lower than that of free DOX. On the other hand, the antitumor activity of the DOX-loaded, pH-sensitive, PEGylated nanogel against the human hepatoma cell line HuH-7, which is a natural drug-resistant tumor line, was superior to that of both free DOX and the DOX-loaded, pH-insensitive, PEGylated nanogel[2]. These findings suggest that the pH-sensitive PEGylated nanogel represents a promising nano-sized carrier for anticancer drug delivery systems *in vivo*.

1 H. Hayashi, M. Iijima, K. Kataoka, Y. Nagasaki, *Macromolecules*, **2004,** 37, 5389

2 M. Oishi, H. Hayashi, M. Iijima, Y. Nagasaki *J. Mat.Chem.* **2007**, 17, 3720