両性イオン界面活性剤の自己集合に基づく金属微粒子の形状維持濃縮

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Shape Conservation and Concentration of Metal Particles based on Self-Assembly of Zwitterionic Surfactants ([1]*Faculty of Symbiotic Systems Sci., Fukushima Univ.*, [2]*JAEA,* [3]*Graduate School of Sci., Univ. of Tokyo,* [4]*PerkinElmer Japan,* [5]*Institute of environmental radioactivity, Fukushima Univ.*) ○Reika Suzuki[1], Taichi Nakagawa[1,2], Makoto Matsueda[2], Yuta Abe[2], Takafumi Hirata[3], Makoto Furukawa[1,4], Yoshitaka Takagai[1,5]

Research project concerning the measurements of dispersed metal particles in radioactive discharged wastewater from Fukushima Daiichi Nuclear Power Plant and the resultant understanding the components or conditions of fuel debris in current reactors from the particles is now in progress. Since it is difficult to measure the actual concentration of the particle due to low levels, it is necessary to preconcentrate the particles maintaining the shape. In this presentation, we present the condensation method of metal particles maintaining the shape and size using temperature dependent phase separation of zwitterionic surfactants. The sample solution including dispersive fine metal particles was prepared using simulated debris by the laser ablation and was then concentrated by proposed method, and analyzed by TEM. The actual preconcentration ratio was 15.2 times. The shapes of the particles were almost spherical, and were maintained between before and after concentration. The particle sizes were 21.3 ± 22.6 nm (n = 156) and 24.0 ± 25.7 nm (n = 77) for the before and after concentration, respectively. Little differences of the particle size were observed between before and after the concentration. As a result of concentrating particles of uranium ore (natural stone), the actual preconcentration ratio was 3.4 to 82.5 times.
Keywords : zwitterionic surfactant; self-assembly; metal particles; concentration; shape conservation

　福島第一原子力発電所の汚染水中に分散する金属微粒子を測定し，燃料デブリの状態や組成を間接的に推定する研究が行われている。汚染水中の金属微粒子の粒子濃度は希薄で測定が困難であるため，形状を維持したまま濃縮する必要がある。本研究では，両性イオン界面活性剤の温度依存相分離現象を利用した金属微粒子の濃縮と形状観察の結果について報告する。模擬デブリを液中レーザーアブレーション法で水溶液に分散させた後、本法で濃縮し濃縮前後の形状および粒径を TEM で分析した。実質濃縮倍率は 15.2 倍であり，その微粒子の形状は球状を示し濃縮前後で形状は変化しなかった。粒子径は，濃縮前は 21.3 ± 22.6 nm (n = 156)，濃縮後は 24.0 ± 25.7 nm (n = 77) であり，濃縮前後で粒子径に大きな変化はなかった。また，ウラン鉱石(自然石)の微粒子を濃縮した結果，実質濃縮倍率は 3.4～82.5 倍であった。