# Assessing in situ Remediation Efficacy of Advanced Aerogel Adsorbent by Using Model Aquatic Culture of *Paramecium caudatum* Exposed to Hg(II)

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Owing to the high toxicity and high bioaccumulation factor of mercury, a large variety of high performance and selective adsorbents have recently been developed for the removal of aqueous Hg(II). Only a handful of these new advanced functional materials are reported to be tested in natural waters, and no systematic study has been reported to prove the practical suitability of these adsorbents for environmental remediation by utilizing model systems that include living aquatic organisms. Silica-gelatin hybrid aerogel of 24wt.% gelatin content is an advanced functional material suitable for the high performance selective adsorption of aqueous Hg(II). [1] The in situ remediation efficacy of this advanced adsorbent was tested under realistic aquatic conditions by exposing cultures of *Paramecium caudatum* to increasing concentrations of Hg(II) and monitoring the model cultures by time-lapse video microscopy. The viability of paramecia was quantified by analyzing the pixel differences of the sequential images caused by the persistent movement of paramecia. The viability of paramecia steeply decreases with the increasing concentration of aqueous Hg(II) above 125 μg $L^{-1}$ Hg(II), and displays a clear exposure-response relationship. The survival of paramecia increases significantly when 0.1 mg $mL^{-1}$ aerogel adsorbent is present in the Hg(II) exposed cultures. In the presence of the aerogel adsorbent, the viability of the cells decreases only at Hg(II) concentrations higher than 500 μg $L^{-1}$, and the increase of survival is detectable even at 1000 μg $L^{-1}$ Hg(II). The survival time of the paramecia is inversely proportional to the amount of Hg(II) taken up by the cells, that correlates with the equilibrium concentration of aqueous Hg(II) in the culture medium. The equilibrium concentration of aqueous Hg(II) is significantly lower in the remediated cultures due to the adsorption of Hg(II) on the aerogel. [2]

References

1. Herman, P., Fábián, I. and Kalmár, J., *Mesoporous Silica–Gelatin Aerogels for the Selective Adsorption of Aqueous Hg(II)*. ACS Appl. Nano Mat. **3**(1): p. 195-206 (2020).

2. Herman, P., Kiss, A., Fábián, I. and Kalmár, J., *Assessing in situ Remediation Efficacy of Advanced Aerogel Adsorbent by Using Model Aquatic Culture of Paramecium caudatum Exposed to Hg(II).* Submitted to publication.