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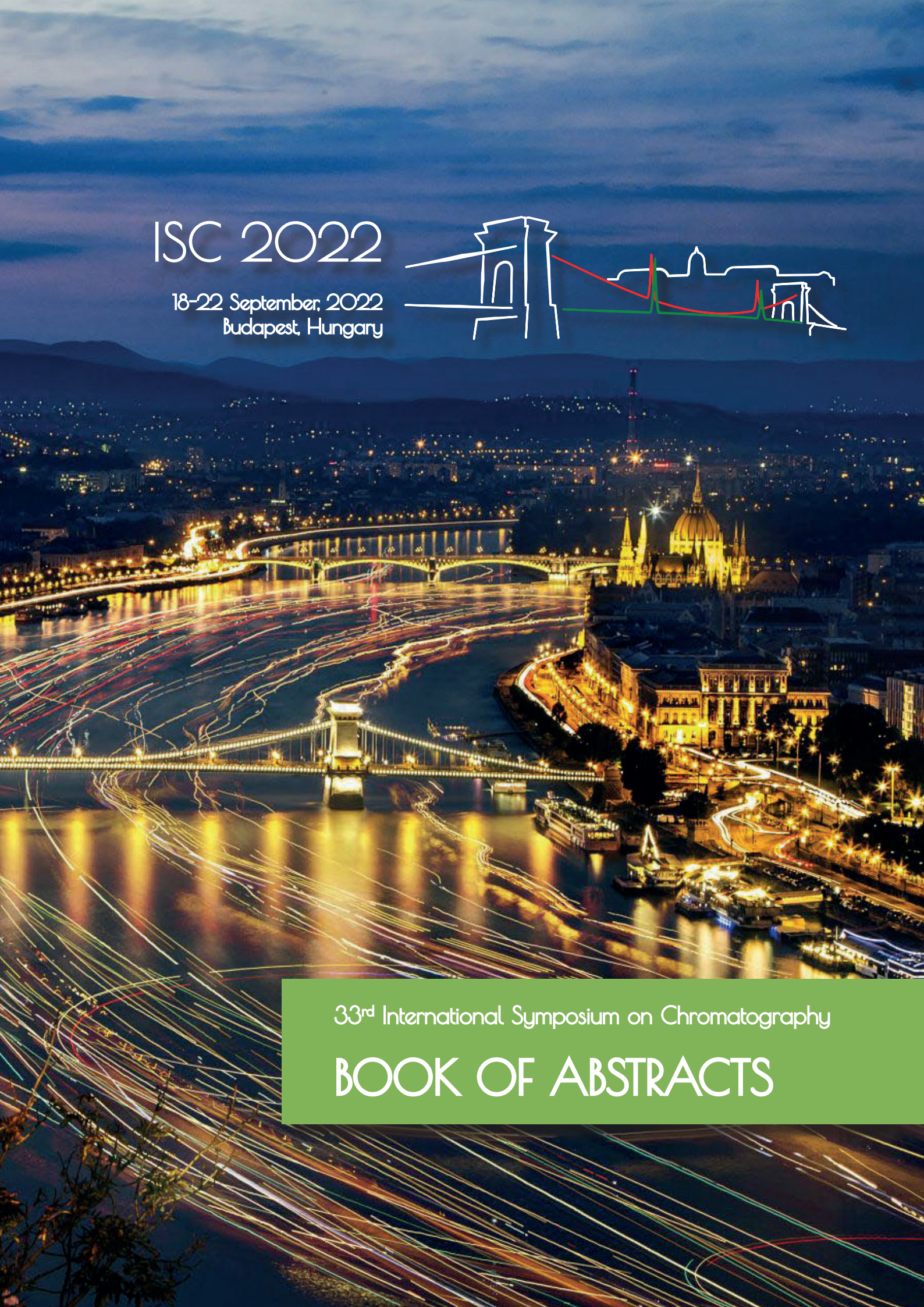

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Separation of Heavy Metals from Aqueous Solution using Scallop Shells as Adsorbent Material. Investigation of the Interactions of Metals with Shell Matrix Components

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Mollusc shells are formed by a biologically controlled mineralisation that leads to the formation of superimposed $CaCO_3$ layers [1]. The reuse of mollusc shells, generated as a waste by seafood processing, as adsorbents could potentially be a cost-effective approach for the removal of heavy metals in water remediation technologies. Indeed, the composition of the shell matrix is suitable for the uptake of metal ions dissolved in water. Heavy metals are common pollutants found in natural waters, especially nearby mining sites and metalworking industries. For example, cadmium represent a contaminant of major interest because of its toxicity even at low concentrations: it substitutes calcium and zinc in biological processes leading to the alteration of cellular metabolism [2]. In this study we investigated the adsorption and diffusion of metals through the shell layers, and the interactions with the shell components. In the case of cadmium, the main uptake mechanism resulted to be ion exchange between Ca of the shell and Cd present in solution, with the formation of $CdCO_3$. LA-ICP-MS 2D-images showed that Cd is adsorbed mainly on the outer layers with little diffusion towards the shell interior. Moreover, the presence of organic substances in the shell matrix, in particular pigments, proved to increase the metal uptake from the aqueous solution.

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