

“Conducting polymer-coated latexes: new synthetic mimics for micro-meteorites”

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The synthesis of conducting polymer-coated latexes is described [1-4]. These particles have been extensively characterised in terms of their particle size, morphology, conducting polymer content and electrical conductivity using techniques such as scanning electron microscopy, atomic force microscopy, Raman spectroscopy, elemental microanalyses and the four-point probe method [1-8]. Hypervelocity impact experiments using these conducting polymer-coated latexes as projectiles impinging on metal targets have been conducted in collaboration with Dr. M. J. Burchell of the University of Kent, UK [9-11]. Hypervelocities of up to 15 km sec⁻¹ have been achieved, with smaller latexes attaining higher hypervelocities. It is shown that either atomic plasma or molecular plasma can be obtained, depending on the precise hypervelocity of the impinging latex particles. The molecular features observed in the plasma mass spectra generated by these hypervelocity impacts are assigned to the polystyrene latex core, rather than the conducting polymer overlayer, since the former component comprises over 90 % of the mass of the projectile. This assignment was confirmed by obtaining the same plasma mass spectra using different conducting polymer coatings (polypyrrole, polyaniline and PEDOT). More recently, hypervelocity impact experiments using these conducting polymer-coated latexes impinging on silica aerogel targets have also been conducted by Prof. H. Yano and Ms. K. Okudaira at JAXA/ISAS in Japan [12]. The implications of these results for the Cassini and Stardust space missions are briefly discussed.

1. S. F. Lascelles, S. P. Armes, *J. Mater. Chem.*, **1997**, 7(8), 1339
2. C. Barthet, S. P. Armes, S. F. Lascelles, S. Y. Luk, H. M. E. Stanley, *Langmuir* **1998**, 14, 2032
3. M. A. Khan, S. P. Armes, *Langmuir*, **1999**, 15, 3469
4. D. B. Cairns, S. P. Armes, L. G. B. Bremer, *Langmuir*, **1999**, 15, 8052
5. C. Barthet, S. P. Armes, M. M. Chehimi, C. Bilem, M. Omastova, *Langmuir*, **1998**, 14, 5032
6. M. A. Khan, S. P. Armes, C. Perruchot, M. Omastova, M. M. Chehimi, S. J. Greaves, J. F. Watts, *Langmuir*, **2000**, 16, 4171
7. S. F. Lascelles, S. P. Armes, P.A. Zhdan, S. J. Greaves, A. M. Brown, J. F. Watts, S. R. Leadley, S. Y. Luk, *J. Mater. Chem.*, **1997**, 7(8), 1349
8. D. B. Cairns, S. P. Armes, M. M. Chehimi, C. Perruchot, M. Delamar *Langmuir*, **1999**, 15, 8059
9. M. J. Burchell, M. J. Willis, S. P. Armes, M. A. Khan, M. J. Percy, C. Perruchot, *Planetary and Space Science*, **2002**, 50, 1025
10. B. J. Goldsworthy, M. J. Burchell, M. J. Cole, S. F. Green, M. R. Leese, N. McBride, J. A. M. McDonnell, M. Muller, E. Grun, R. Srama, S. P. Armes and M. A. Khan, *Adv. Space Research*, **2002**, 29, 1139-1144
11. M. J. Burchell, M. J. Cole, S. F. Lascelles, M. A. Khan, C. Barthet, S. A. Wilson, D. B. Cairns and S. P. Armes, *J. Phys. 'D': Appl. Phys.*, **1999**, 32, 1719-1728
12. H. Yano, K. Okudaira, S. Fujii, S. P. Armes, manuscript in preparation