s7.m2.o5 TEM investigation of catalysts for the direct oxidation of methanol in membrane fuel cells. N. Martz, C. Roth, H. Fuess. *Institute of Material Science, Technical University Darmstadt, Petersenstr. 23, D-64287 Darmstadt*
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In transportation systems and for mobile units application of direct methanol fuel cells (DMFCs) is proposed as they offer solutions for environmental problems.

The direct oxidation of methanol in membrane fuel cells produces carbon monoxid. Chemisorbed carbon monoxid is however blocking the electrocatalytic acting Pt sites thereby decreasing the cell potential. By addition of (transition) metals or metallocomplexes cocatalytic effects are observed, e.g. in the binary PtRu, PtW and PtMo system and for ternary PtRuW and PtCoPc respectively. The best results are obtained with a PtRu (50:50) supported on carbon.

We studied commercial PtRu purchased from E-TEK Inc. and PtRu-catalysts synthetized by conventional reduction methods[1,2] and by a colloidal technique[3]. Each sample was heated to 500°C and hold five hours either in natural air or under nitrogen flow.

The various samples were characterized with transmission electron microscopy (TEM), energy dispersive X-ray (EDX) and X-Ray diffraction (XRD)[4]. Differences in structure, particle size and composition were observed depending on the synthesis. TEM and HREM images of the conventionally synthesized catalysts show particles with sizes 3-5 nm forming agglomerates up to 10 nm in the centre of the carbon grains. The PtRu catalyst from E-TEK exhibits highly-dispersed nanocrystals with size ≈ 2nm distributed on the edges of the support grains. Each sample was investigated by nano EDX to dertermine the local composition.

Notes

[1] J.B. Goodenough, A. Hamnett, B.J. Kennedy, R. Manoharan and S.A. Weeks, Electrochemica Acta 35 (1990) 199-207.
[2] Degussa, EP 0880188A2, 1998.
[3] H. Bönnemann, W. Brijoux, R. Brinkmann, E. Dinjus, T. Joußen,B. Korall, Angew. Chem. Int. Ed. Engl. 30 (1991) 1312.
[4] C. Roth, N. Martz, H. Fuess, Characterisation of binary and ternary fuel cell catalysts by XRD and TEM, Poster ECM, Nancy 2000.