PROGRESS REPORT and RESEARCH OUTCOMES

1. Nitrogen gas adsorption

Micron and nano-sized silicon carbide powders were coated with polycarbosilane (PCS) by mixing in heptane. Coated powders were dried and pyrolysed up to 1200°C in nitrogen. This preparation work was performed at Sydney University.

Nitrogen gas adsorption of powders containing i) 50 wt% PCS / 50 wt% nano-sized SiC ii) 50 wt% PCS / 50 wt% micron-sized SiC, and iii) 10 wt% PCS / 90 wt% micron-sized SiC was performed at ANSTO.

BET surface areas for 50 wt% PCS / 50 wt% powders were higher for coated nano-sized SiC powders than for micron-sized SiC powders (Figure 1).

BET surface areas decreased with increasing pyrolysis temperature for 50 wt% PCS / 50 wt% nano-sized SiC, 50 wt% PCS / 50 wt% micron-sized SiC and 10 wt% PCS / 90 wt% micron-sized SiC (Figure 1).

Further work: Nitrogen adsorption is planned for 10 wt% PCS / 90 wt% nano-sized SiC, micron-sized and nano-sized SiC powders pyrolysed to 600, 800, 1000 and 1200°C. These results are necessary to complete our analysis on the influence of PCS wt%, SiC particle size and pyrolysis temperature on the porosity of PCS coated SiC powders.

2. X-ray diffraction

The aim of this work was to monitor the transition between phases during the pyrolysis of PCS and PCS coated powders. In-situ pyrolysis was unsuccessful due to powder expansion and migration away from the hot zone during reaction, resulting in the sample moving from the x-ray path.

Future work: Ex-situ pyrolysis of powders is necessary (to be undertaken at Sydney University) prior to a repeat of these experiments.
Figure 1: BET surface areas as a function of final pyrolysis temperature for PCS coated SiC powders pyrolysed in nitrogen.

None

PhD STUDENTS

PhD Student: Andrew Maddocks

Thesis title: Nanoporous silicon carbide materials: evaluation of novel preparation techniques

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