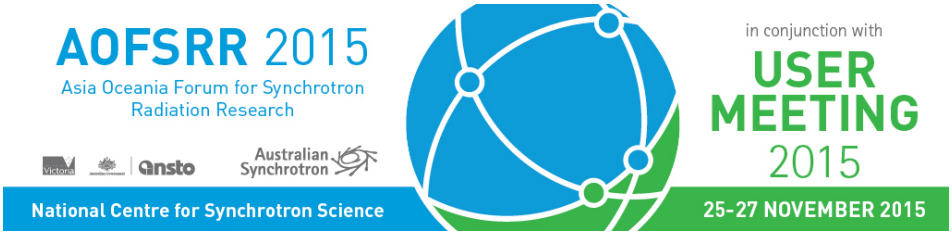

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Formation and characterisation of a silicon terminated (100) diamond surface

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Over the past decade, the interest in diamond materials science, in particular diamond surface science, has grown dramatically. The interest in the surface comes about due to the wide range of properties which the surface can exhibit upon a simple change in the terminating species. The functionalised surfaces of diamond, in particular the oxygen and hydrogen terminations, have provided a route to the realisation of a number of device applications for high power, high frequency components and for biosensing.

A newly emerging generation of diamond device architectures incorporate nitrogen vacancy (NV) centers, which in bulk diamond show properties which are of interest for nano-magnetometry, quantum information processing and as biological tracers. However, the development of future devices permitting the detection of single electron spin requires that a NV center be placed within nanometers of the surface. This environment has undesirable effects on the paramagnetic NV- state, as existing surface terminations either quench the fluorescence of the NV center by interfering with the NV- state, or produce randomly oriented surface spins which limit the sensitivity of the NV—state. There is therefore a need for an alternative surface termination which will address these limitations. Presented here are the results of a series of synchrotron experiments in which a novel silicon terminated (100) diamond surface has been developed, which has some potential as a suitable termination for shallow NV center applications.

Keywords

Diamond, surface termination, nitrogen vacancies, photoemission, soft x-ray

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