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Guest Chain "Melting" in Incommensurate Host-Guest Potassium EMMA MCBRIDE, KEITH MUNRO, MALCOLM MCMAHON, SUPA, School of Physics and Astronomy, and Centre for Science at Extreme Conditions, The University of Edinburgh, Edinburgh, UK — Upon increasing pressure the group-I elements transform from close-packed structures (*bcc* and *fcc*) to a series of low-symmetry complex structures. Residing in the middle of the group, potassium (K) has numerous structures in common with its neighbours, and, in fact, is remarkably structurally similar to sodium (Na) and rubidium (Rb). For example, the post-*fcc* transition in K is to a composite incommensurate host-guest structure ($tI19$), and the host structure of this phase is isostructural with that found in Na and Rb. Previously we have reported that below 16.7GPa, the Bragg peaks from the guest component of $tI19$–Rb broaden considerably, signalling a loss of the inter-chain correlation, or a "melting" of the chains. Furthermore, in $tI19$-Na above 125 GPa, the Bragg peaks from the guest component are also broadened, suggesting that the guest chains are also nearly "melted." During studies of the melting curve of K, we observed that the guest peaks from $tI19$-K broaden dramatically on heating. Here we report single-crystal, quasi-single-crystal, and powder synchrotron x-ray diffraction measurements of $tI19$-K to 50 GPa and 800 K, which allowed a detailed study of this chain "melting" transition. The order-disorder transition is clearly visible over a 30 GPa pressure range, and there are significant changes in the gradient of the phase boundary, which may be influenced by the nature of the guest structure. Furthermore, data extending the melting curve will also be presented.

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